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AERONAUTICAL ACCESSORIES, INC.

P.O. BOX 3689 BRISTOL, TENNESSEE 37625-3689 USA
TELEPHONE: 423-538-5151 TOLL FREE: 800-251-7094
TELEFAX: 423-538-8469 E-MAIL: sales@aero-access.com

TECHNICAL BULLETIN

TB No. AA-07174
Revision A

SUBJECT:	**SFIM PA85-31 Two Axis Autopilot – Bell 407** HAS-909-00147-01/-02/-03/-04 Autopilot Kit upgrade to HAS-909-00147-05/-06/-07/-08 Autopilot Kit
MODELS AFFECTED:	Bell Helicopter Textron Model 407 Helicopters with Aeronautical Accessories, Inc. SAGEM (SFIM®) PA-85 Autopilot Kit in accordance with STC SR00790NY.
COMPLIANCE:	Compliance with this bulletin is per Customer's option or upon replacement of obsolete parts.
DESCRIPTION:	This Technical Bulletin is for replacement of the Pitch, Roll, and Yaw series actuators and the Fiber Optic Gyro (as applicable) for use in the HAS-909-00147-05 2 Axis Autopilot Kit, HAS-909-00147-06 2 Axis Autopilot Kit with Flight Director Coupler Kit, HAS-909-00147-07 2 Axis Autopilot Kit with Yaw Stability Augmentation System Kit, and HAS-909-00147-08 2 Axis Autopilot Kit with Flight Director Coupler Kit and Yaw Stability Augmentation System Kit.

IF OWNERSHIP OF AIRCRAFT HAS CHANGED, PLEASE FORWARD THIS BULLETIN TO NEW OWNER

DESCRIPTION (Con't)

Pitch and Roll:

Part I of this bulletin will address SAGEM Smart Electro-Mechanical Actuator (SEMA) part number 418-00880-350 as a replacement part for 418-00870-101 which is no longer manufactured and parts replacement for repairs/overhauls have become obsolete. Replacement of both the Pitch SEMA and Roll SEMA is required concurrently.

CAUTION
The 418-00880-350 Actuator is not a direct replacement for the 418-00870-101 Actuator

Characteristics of the 418-00880-350 SEMA are identical when compared to the 418-00870-101 SEMA with the exception of loss of automatic re-centering upon disengagement/failure.

Relays must be introduced in-line between the Autopilot Computer and each replacement SEMA to retain the capability of the SEMA to automatically re-center after disengagement of the Autopilot System.

Yaw SAS (If Installed):

Part II of this Bulletin will address replacement of SAGEM SEMA part number 418-00876-800 as an alternate part to 418-00847-000 which is no longer manufactured and parts replacement for repairs/ overhauls have become obsolete.

Electrical interface characteristics of these actuators are identical.

Fiber Optic Gyro (If Installed):

Part III of this Bulletin will address replacement of SAGEM FOG part number 438-00100-021 as an alternate part to 438-00100-010.

FAA/DER APPROVAL:	The engineering design data represented by this Bulletin complies with applicable Federal Aviation Regulations and is FAA approved.
MANPOWER:	Part I – Approximately 56.0 man-hours
	Part II – Approximately 12.0 man-hours
	Part III – Approximately 4.0 man-hours

Man-hours are based on hands-on time, and may vary with personnel and facilities available.

IF OWNERSHIP OF AIRCRAFT HAS CHANGED, PLEASE FORWARD THIS BULLETIN TO NEW OWNER

LOG OF REVISIONS

Revision	Date	Description	Pages
-	12/19/07	Original Release	All
A	08/12/08	Added M39029/5-115 Contact (Qty 14) to Material List	5
		Revised Required Tools	6
		Revised Part I - Section 4.0, Steps 9 - 14	12, 13
		Revised Part I - Section 4.0, Steps 22 - 27	13,14
		Revised Part I - Section 5.0, Step 17	15
		Revised Part II - Section 3.0, Step 9	18
		Revised Part III – Section 2.0, Step 7	19
		Revised Section C1.1.4, Step 5	37
		Revised Section C1.2.2, Step 1, 3, and 7	37,38
		Revised Section C1.2.5, Step 5 and 6	39

MATERIAL:

The following materials are required to comply with this bulletin:

Pitch and Roll SEMA Replacement

Qty	Part Number	Description
1	099-050-121	Adhesive (Magnobond 6398 A&B)
1	099-859-002	Syringe, 15cc
2	23350AC100LE	Bend Washer
2	404SE832-08-2	Insert
2	418-00880-350	Actuator
2	M12883/52-002	Socket
1	M12883/53-001	Mounting Track
20 ft	M27500-22SM2N23	Wire, Shielded
40 ft	M22759/41-22-9	Wire
14	M39029/5-115	Contact
2	M83536/6-025M	Relay
4	MS24665-151	Cotter Pin
2	MS24694-S4	Screw

Yaw SEMA Replacement (If Installed)

Qty	Part Number	Description
1	418-00876-800	Actuator
1	23350AC100LE	Bend Washer
2	MS24665-151	Cotter Pin

Fiber Optic Gyro Replacement (If Installed)

Qty	Part Number	Description
1	438-00100-021	Fiber Optic Gyro

Documentation
(Required for Pitch and Roll SEMA, Yaw SEMA,
or Fiber Optic Gyro Replacement)

Qty	Part Number	Description
1	AA-04119	RFMS for AFCS with or without Yaw SAS
1	AA-04126	RFMS for AFCS with Flight Director/Coupler and with or without Yaw SAS
1	MM97-11-01	ICA for AFCS with Flight Director/Coupler and with or without Yaw SAS

These materials are available from Aeronautical Accessories, Inc.
Contact AAI Sales Department at 1-800-251-7094 or sales@aero-access.com.

REQUIRED TOOLS:

GTU 85-1 Ground Test Unit (Part I – Section 2.0; Appendix A)
(Contact Aeronautical Accessories, Inc for availability)

Fine Grit Scotchbrite Pad (Part I – Section 3.0)

M22520/1-01 Crimping Tool and M22520/1-02 RED Positioner (Part I - Section 4.0)
(Alt: M22520/2-01 Crimping Tool and M22520/2-02 Positioner)
(Alt: M22520/7-01 Crimping Tool and M22520/7-02 Positioner)

M81969/14-11 Installing Tool (Part I – Section 4.0)
(Alt: M81969/8-05 Installing Tool)

T102019 Actuator Rigging Tool (Appendix A)

NAS1305 Rigging Bolt (Appendix A)

407-201-300 Swashplate Rigging Tool (Appendix A)

Digital Protractor (Appendix A)

Hydraulic Test Stand, 1500 PSI (10342 kPa) pressure max, 3.0 GPM (11.4 Liters per Minute), 10 micron (390 Microinch) filter (Appendix A)

WEIGHT AND BALANCE:

Net weight change - Negligible

ELECTRICAL LOAD DATA:

An additional load of 1.0 A is incurred when the Autopilot System is powered (cycled) On or Off due to the engagement of the Re-Centering Relays. The Re-Centering Relays are static (non-functional) during normal operation.

PUBLICATIONS REQUIRED:

AA-04119	Rotorcraft Flight Manual Supplement for SFIM PA-85T-31 Automatic Flight Control System with or without Yaw Stability Augmentation System
AA-04126	Rotorcraft Flight Manual Supplement for SFIM PA-85T-31 Automatic Flight Control System with Flight Director/Coupler with or without Yaw Stability Augmentation System
MM97-11-01	Instructions for Continued Airworthiness for SFIM PA-85T-31 AFCS Automatic Flight Control System with Flight Director/Coupler with or without Yaw Stability Augmentation System

Contact Aeronautical Accessories, Inc. for the above publications.

Any questions regarding this bulletin should be addressed to:

AERONAUTICAL ACCESSORIES, INC.
P.O. Box 3689
Bristol, TN 37625-3689

PRODUCT SUPPORT
1-800-251-7094
techsupport@aero-access.com

PART I – PITCH AND ROLL SEMA REPLACEMENT ACCOMPLISHMENT INSTRUCTIONS

WARNING

REMOVE BATTERY AND EXTERNAL POWER FROM AIRCRAFT PRIOR TO PERFORMING TECHNICAL BULLETIN INSTRUCTIONS.

NOTE

Refer to Bell Helicopter Model 407 Maintenance Manual and all applicable maintenance manuals and/or ICAs for disassembly/reassembly instructions not specifically addressed in this document.

1.0 PITCH AND ROLL CONTROL TUBE REMOVAL

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Open the Forward Fairing Assembly per BHT-407-MM-5 Maintenance Manual, Paragraph 53-59 and remove the Transmission Fairing Assembly per BHT-407-MM-5 Maintenance Manual, Paragraph 53-63.
3. Remove the Vertical Tunnel Lower Access Panel on the belly of the helicopter per BHT-407-MM-5 Maintenance Manual, Chapter 53.
4. Remove the Vertical Tunnel Forward Access Panel located between the crew seats per BHT-407-MM-5 Maintenance Manual, Chapter 53.
5. Remove the **GREEN** Pitch SEMA electrical connector.
6. Disconnect the Pitch Control Tube from the Lower Bellcrank by removing the attaching hardware as shown in Figure 1. Discard Cotter Pin but retain remaining hardware for re-installation.
7. Support Pitch Control Tube and disconnect from the Upper Bellcrank by removing the attaching hardware as shown in Figure 1. Discard Cotter Pin but retain remaining hardware for re-installation.
8. Carefully remove Pitch Control Tube through the top of the vertical control tunnel.
9. Remove the **RED** Roll SEMA electrical connector.
10. Disconnect the Roll Control Tube from the Lower Bellcrank by removing the attaching hardware as shown in Figure 2. Discard Cotter Pin but retain remaining hardware for re-installation.
11. Support Roll Control Tube and disconnect from the Upper Bellcrank by removing the attaching hardware as shown in Figure 2. Discard Cotter Pin but retain remaining hardware for re-installation.
12. Carefully remove Roll Control Tube through the top of the vertical control tunnel.
13. Send removed control tubes to AAI for installation of the 418-00880-350 Actuators.

2.0 PITCH AND ROLL SEMA INSTALLATION (OPTIONAL)

NOTE

Proceed with the following steps if the Pitch and Roll Control Tubes are not sent to AAI for installation of the 418-00880-350 Actuators.

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Remove Safety Wire and Screws (4) that attach the existing SEMA to the Pitch Control Tube as shown in Figure 3. Retain Screws for re-installation.
3. Remove existing SEMA from Pitch Control Tube.
4. Straighten Bend Washer and loosen Jam Nut as shown in Figure 3.

WARNING

JAM NUT IS LEFT HAND THREADED. HOLD THE SEMA SHAFT WITH A WRENCH WHEN LOOSENING NUT.

5. Remove Rod End Assembly from existing SEMA as shown in Figure 3 and discard Bend Washer.
6. Install 23350AC100LE Bend Washer on Rod End Assembly and thread Rod End Assembly into 418-00880-350 Actuator as shown in Figure 3.
7. Adjust Rod End Assembly to the 3.75 and 11° dimensions shown in Figure 3 for the Pitch Control Tube.
8. Torque Jam Nut to 80 – 100 in-lbs and lock in place with Bend Washer.
9. Locate 418-00880-350 Actuator in position on Pitch Control Tube and install using the Screws (4) retained in Step 2. Torque Screws (4) to 40 in-lbs.
10. Safety Screws (4) with .021 Safety Wire per AC43.13-1B, Chapter 7, Section 7.
11. Check the SEMA and Rod End Assembly for the proper overall dimension of 10.00 as shown in Figure 3. If the overall dimension is not correct, re-center the SEMA using the GTU 85-1 Ground Test Unit prior to performing any rigging checks (Ref Appendix A - Pitch and Roll Cyclic Control Rigging).
12. Remove Safety Wire and Screws (4) that attach the existing SEMA to the Roll Control Tube as shown in Figure 3. Retain Screws for re-installation.
13. Remove existing SEMA from Roll Control Tube.
14. Straighten Bend Washer and loosen Jam Nut as shown in Figure 3.

WARNING

JAM NUT IS LEFT HAND THREADED. HOLD THE SEMA SHAFT WITH A WRENCH WHEN LOOSENING NUT.

15. Remove Rod End Assembly from existing SEMA as shown in Figure 3 and discard Bend Washer.
16. Install 23350AC100LE Bend Washer on Rod End Assembly and thread Rod End Assembly into 418-00880-350 Actuator as shown in Figure 3.
17. Adjust Rod End Assembly to the 3.75 inch and 11° dimensions shown in Figure 3 for the Roll Control Tube.
18. Torque Jam Nut to 80 – 100 in-lbs and lock in place with Bend Washer.
19. Locate 418-00880-350 Actuator in position on Roll Control Tube and install using the Screws (4) retained in Step 2. Torque Screws (4) to 40 in-lbs.
20. Safety Screws (4) with .021 Safety Wire per AC43.13-1B, Chapter 7, Section 7.
21. Check the SEMA and Rod End Assembly for the proper overall dimension of 10.00 inch as shown in Figure 3. If the overall dimension is not correct, re-center the SEMA using the GTU 85-1 Ground Test Unit prior to performing any rigging checks (Ref Appendix A - Pitch and Roll Cyclic Control Rigging).

3.0 PITCH AND ROLL SEMA RE-CENTERING RELAY INSTALLATION

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Remove the Copilot Seat per BHT-407-MM-3 Maintenance Manual, Chapter 25.
3. Remove Copilot Seat Panel per BHT-407-MM-5 Maintenance Manual, Chapter 53.
4. Locate M12883/53-001 Mounting Track as shown in Figure 4 and mark center of mounting holes on panel.

NOTE

It is permissible to relocate Mounting Track as required to avoid interference with existing equipment.

5. Install 404SE832-08-2 Insert (2) as follows:
   a. Drill .469 - .474 inch diameter hole through one skin only.
   b. Undercut core .25 inch.
   c. Deburr holes and remove debris and loose material from cavity and surface of panel.
   d. Fill cavity one-third full of 099-050-121 Adhesive (Magnobond 6398 A&B). Press insert in place and secure in position with tape. Punch through tape at both injection hole locations.

e. Using the 099-859-002 Syringe, 15cc, inject a slow steady flow of 099-050-121 Adhesive (Magnobond 6398 A&B) through one hole. Continue injecting until a steady flow of 099-050-121 Adhesive (Magnobond 6398 A&B) emerges out of the opposite hole.

f. Remove excess 099-050-121 Adhesive (Magnobond 6398 A&B) and allow to cure for 24 hours at 77 degrees Fahrenheit or 60-90 minutes at 150-180 degrees Fahrenheit.

g. Remove tape. Sand surface of insert and adjacent area with fine grit scotchbrite pad.

h. Brush alodine bare aluminum per MIL-DTL-5541 and prime with epoxy polyamide per MIL-PRF-23377, Type I, Class C2.

6. Secure M12883/53-001 Mounting Track using MS24694-S4 Screw (2) as shown in Figure 4.
7. Install M12883/52-002 Socket (2) and M883536/6-025M Relay (2) into the M12883/53-001 Mounting Track.
8. Label relays as "Pitch Re-Center" and "Roll Re-Center". Label to be placed adjacent to relay using indelible ink or decal as shown in Figure 4.

4.0 PITCH AND ROLL SEMA WIRING MODIFICATION

NOTE

For the following steps refer to Figure 5 – Pre-Mod Pitch and Roll Actuator Wiring Diagram and Figure 6 – Post-Mod Pitch and Roll Actuator Wiring Diagram.

NOTE

All wire routing, wire identification, and splicing to be accomplished in accordance with AC 43.13-1B, Chapter 11 Aircraft Electrical Systems.

1. Ensure that both the battery and external power have been removed from the aircraft.
2. From the **GREEN** Pitch SEMA electrical connector (P8512) remove the following wires as shown in Figure 5: APS23B22R from Pin F and Jumper Wire from Pin D, APS24B22B from Pin K and Jumper Wire from Pin J, APS25B22 from Pin G and Jumper Wire from Pin C, and APS26A22 from Pin E.
3. Remove and discard the Jumper wire and associated splice from APS23B22R, APS24B22B, and APS25B22.
4. On the Pitch Actuator Re-Centering Socket connect the following wires as shown in Figure 6: APS23B22R to Pin D1, APS24B22B to Pin C1, APS25B22 to Pin X1, and APS26A22 to Pin B1.

5. Using M27759/41-22-9 Wire connect a Jumper Wire from Pin A1 on the Pitch Actuator Re-Centering Relay and splice into APS25B22 per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
6. Using M27759/41-22-9 Wire connect to Pin A3 on the Pitch Actuator Re-Centering Relay and splice into APS20B20 per AC 43.13-1B, Chapter 11, Section 13 as shown by TB-APS1A22 in Figure 6. Identify wire as TB-APS1A22 in accordance with AC 43.13-1B, Chapter 11, Section 16.
7. Using M27759/41-22-9 Wire connect to Pin X2 on the Pitch Actuator Re-Centering Relay and splice into APS22A20N per AC 43.13-1B, Chapter 11, Section 13 as shown by TB-APS2A22N in Figure 6. Identify wire as TB-APS2A22N in accordance with AC 43.13-1B, Chapter 11, Section 16.
8. Using M27759/41-22-9 Wire connect Jumper Wires from Pin C3 and D3 on the Pitch Actuator Re-Centering Relay and splice into TB-APS2A22 per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
9. Using M27500-22SM2N23 Wire, Shielded and M39029/5-115 Contact connect from Pin D2 on the Pitch Actuator Re-Centering Socket to Pin F on the **GREEN** Pitch SEMA electrical connector (P8512) as shown by TB-APS23B22R in Figure 6. Connect from Pin C2 on the Pitch Actuator Re-Centering Socket to Pin K on the **GREEN** Pitch SEMA electrical connector (P8512) as shown by TB-APS24B22B in Figure 6. Identify wires as TB-APS23B22R and TB-APS24B22B in accordance with AC 43.13-1B, Chapter 11, Section 16.
10. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin D on the **GREEN** Pitch SEMA electrical connector (P8512) and splice into TB-APS23B22R per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
11. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin J on the **GREEN** Pitch SEMA electrical connector (P8512) and splice into TB-APS24B22B per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
12. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect from Pin A2 on the Pitch Actuator Re-Centering Socket to Pin G on the **GREEN** Pitch SEMA electrical connector (P8512) as shown by TB-APS25B22 in Figure 6. Identify wire as TB-APS25B22 in accordance with AC 43.13-1B, Chapter 11, Section 16.
13. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin C on the **GREEN** Pitch SEMA electrical connector (P8512) and splice into TB-APS25B22 per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.

14. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect from Pin B2 on the Pitch Actuator Re-Centering Socket to Pin E on the **GREEN** Pitch SEMA electrical connector (P8512) as shown by TB-APS26A22 in Figure 6. Identify wire as TB-APS26A22 in accordance with AC 43.13-1B, Chapter 11, Section 16.
15. From the **RED** Roll SEMA electrical connector (P8513) remove the following wires as shown in Figure 5: APS28B22R from Pin K and Jumper Wire from Pin J, APS29B22B from Pin F and Jumper Wire from Pin D, APS30B22 from Pin G and Jumper Wire from Pin C, and APS31A22 from Pin E.
16. Remove and discard the Jumper wire and associated splice from APS28B22R, APS29B22B, and APS30B22.
17. On the Roll Actuator Re-Centering Socket connect the following wires as shown in Figure 6: APS28B22R to Pin D1, APS29B22B to Pin C1, APS30B22 to Pin X1, and APS31A22 to Pin B1.
18. Using M27759/41-22-9 Wire connect a Jumper Wire from Pin A1 on the Roll Actuator Re-Centering Relay and splice into APS30B22 per AC 43.13-1B, Chapter 11, Section 16 as shown in Figure 6.
19. Using M27759/41-22-9 Wire connect to Pin A3 on the Roll Actuator Re-Centering Relay and splice into APS20C20 per AC 43.13-1B, Chapter 11, Section 13 as shown by TB-APS3A22 in Figure 6. Identify wire as TB-APS3A22 in accordance with AC 43.13-1B, Chapter 11, Section 16.
20. Using M27759/41-22-9 Wire connect to Pin X2 on the Roll Actuator Re-Centering Relay and splice into APS27A20N per AC 43.13-1B, Chapter 11, Section 13 as shown by TB-APS4A22N in Figure 6. Identify wire as TB-APS4A22N in accordance with AC 43.13-1B, Chapter 11, Section 16.
21. Using M27759/41-22-9 Wire connect Jumper Wires from Pin C3 and D3 on the Roll Actuator Re-Centering Relay and splice into TB-APS4A22 per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
22. Using M27500-22SM2N23 Wire, Shielded and M39029/5-115 Contact connect from Pin D2 on the Roll Actuator Re-Centering Socket to Pin K on the **RED** Roll SEMA electrical connector (P8513) as shown by TB-APS28B22R in Figure 6. Connect from Pin C2 on the Roll Actuator Re-Centering Socket to Pin F on the **RED** Roll SEMA electrical connector (P8513) as shown by TB-APS29B22B in Figure 6. Identify wires as TB-APS28B22R and TB-APS29B22B in accordance with AC 43.13-1B, Chapter 11, Section 16.
23. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin D on the **RED** Roll SEMA electrical connector (P8513) and splice into TB-APS29B22B per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.

24. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin J on the **RED** Roll SEMA electrical connector (P8513) and splice into TB-APS28B22R per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
25. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect from Pin A2 on the Roll Actuator Re-Centering Socket to Pin G on the **RED** Roll SEMA electrical connector (P8513) as shown by TB-APS30B22 in Figure 6. Identify wire as TB-APS30B22 in accordance with AC 43.13-1B, Chapter 11, Section 16.
26. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect a Jumper Wire from Pin C on the **RED** Roll SEMA electrical connector (P8513) and splice into TB-APS30B22 per AC 43.13-1B, Chapter 11, Section 13 as shown in Figure 6.
27. Using M27759/41-22-9 Wire and M39029/5-115 Contact connect from Pin B2 on the Roll Actuator Re-Centering Socket to Pin E on the **RED** Roll SEMA electrical connector (P8513) as shown by TB-APS31A22 in Figure 6. Identify wire as TB-APS31A22 in accordance with AC 43.13-1B, Chapter 11, Section 16.

5.0 PITCH AND ROLL CONTROL TUBE INSTALLATION

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Carefully install the Pitch Control Tube into position through the top of the vertical control tunnel.
3. Locate and align the Pitch Control Tube Clevis over the Upper Bellcrank Bearing and install the Pitch Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-84 Cyclic Control Linkage-Installation.
4. Align the Pitch Control Tube Lower Rod End with the Lower Bellcrank and install the Pitch Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-84 Cyclic Control Linkage-Installation.
5. Install the **GREEN** Pitch SEMA electrical connector.
6. Carefully install the Roll Control Tube into position through the top of the vertical control tunnel.
7. Locate and align the Roll Control Tube Clevis over the Upper Bellcrank Bearing and install the Roll Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-84 Cyclic Control Linkage-Installation.

8. Align the Roll Control Tube Lower Rod End with the Lower Bellcrank and install the Roll Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-84 Cyclic Control Linkage-Installation.
9. Install the **RED** Roll SEMA electrical connector.
10. Perform Pitch and Roll Cyclic Control Rigging per Appendix A.
11. Perform Pitch and Roll SEMA Operational Checks per Appendix C.
12. Reinstall the Vertical Tunnel Forward Access Panel located between the crew seats per BHT-407-MM-5 Maintenance Manual, Chapter 53.
13. Reinstall the Vertical Tunnel Lower Access Panel on the belly of the helicopter per BHT-407-MM-5 Maintenance Manual, Chapter 53.
14. Reinstall Copilot Seat Panel per BHT-407-MM-5 Maintenance Manual, Chapter 53.
15. Reinstall the Copilot Seat per BHT-407-MM-3 Maintenance Manual, Chapter 25.
16. Reinstall the Transmission Fairing assembly per BHT-407-MM-5 Maintenance Manual, Paragraph 53-65 and close the Forward Fairing Assembly per BHT-407-MM-5 Maintenance Manual, Paragraph 53-61.
17. Annotate Log Book to show that Part I of this bulletin has been accomplished. Insert appropriate Automatic Flight Control System Supplement into the Flight Manual Supplement section of the Rotorcraft Flight Manual and update the Instructions for Continued Airworthiness per the Publications Required listed on Page 6.

PART II – YAW SEMA REPLACEMENT ACCOMPLISHMENT INSTRUCTIONS

WARNING

REMOVE BATTERY AND EXTERNAL POWER FROM AIRCRAFT PRIOR TO PERFORMING TECHNICAL BULLETIN INSTRUCTIONS.

NOTE

Refer to Bell Helicopter Model 407 Maintenance Manual and all applicable maintenance manuals and/or ICAs for disassembly/reassembly instructions not specifically addressed in this document.

1.0 YAW CONTROL TUBE REMOVAL

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Remove the Upper Baggage Compartment Access Panel per BHT-407-MM-5 Maintenance Manual, Chapter 53.
3. Remove the Hat Bin and Sound Proofing Blanket per BHT-407-MM-3 Maintenance Manual, Chapter 25.
4. Remove the Yaw SEMA electrical connector.
5. Disconnect the Yaw Control Tube from the Idler by removing the attaching hardware as shown in Figure 7. Discard Cotter Pin but retain remaining hardware for re-installation.
6. Support the Yaw Control Tube and disconnect from the Beam Assembly by removing the attaching hardware as shown in Figure 7. Discard Cotter Pin but retain remaining hardware for re-installation.
7. Send removed Yaw Control Tube to AAI for installation of the 418-00876-800 Actuators.

2.0 YAW SEMA INSTALLATION (OPTIONAL)

NOTE

Proceed with the following steps if the Yaw Control Tube is not sent to AAI for installation of the 418-00876-800 Actuator.

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Remove Safety Wire and Screws (4) that attach the existing SEMA to the Yaw Control Tube as shown in Figure 8. Retain Screws for re-installation.
3. Remove existing SEMA from Yaw Control Tube.

4. Straighten Bend Washer and loosen Jam Nut as shown in Figure 3.

WARNING

JAM NUT IS LEFT HAND THREADED. HOLD THE SEMA SHAFT WITH A WRENCH WHEN LOOSENING NUT.

5. Remove Rod End Assembly from existing SEMA as shown in Figure 8 and discard Bend Washer.
6. Install 23350AC100LE Bend Washer on Rod End Assembly and thread Rod End Assembly into 418-00880-350 Actuator as shown in Figure 8.
7. Adjust Rod End Assembly to the 3.75 inch and 0° dimensions shown in Figure 8 for the Yaw Control Tube.
8. Torque Jam Nut to 80 – 100 in-lbs and lock in place with Bend Washer.
9. Locate 418-00876-800 Actuator in position on Yaw Control Tube and install using the Screws (4) retained in Step 2. Torque Screws (4) to 40 in-lbs.
10. Safety Screws (4) with .021 Safety Wire per AC43.13-1B, Chapter 7, Section 7.
11. Check the SEMA and Rod End Assembly for the proper overall dimension of 10.00 inch as shown in Figure 8. If the overall dimension is not correct, re-center the SEMA to performing any rigging checks (Ref Appendix B – Yaw Control Rigging).

3.0 YAW CONTROL TUBE INSTALLATION

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Support the Yaw Control Tube and align with the Beam Assembly and install the Yaw Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-84 Cyclic Control Linkage-Installation.
3. Support the Yaw Control Tube and align with the Idler and install the Yaw Control Tube using retained hardware and a MS24665-151 Cotter Pin per BHT-407-MM-8 Maintenance Manual, Paragraph 67-116 Control Tube Assembly – Installation.
4. Install the Yaw SEMA electrical connector.
5. Perform Yaw Control Rigging per Appendix B.
6. Perform Yaw SEMA Operational Checks per Appendix D.

7. Install the Hat Bin and Sound Proofing Blanket per BHT-407-MM-3 Maintenance Manual, Chapter 25.
8. Remove the Upper Baggage Compartment Access Panel per BHT-407-MM-5 Maintenance Manual, Chapter 53.
9. Annotate Log Book to show that Part II of this bulletin has been accomplished. Insert appropriate Automatic Flight Control System Supplement into the Flight Manual Supplement section of the Rotorcraft Flight Manual and update the Instructions for Continued Airworthiness per the Publications Required listed on Page 6.

PART III – FIBER OPTIC GYRO REPLACEMENT ACCOMPLISHMENT INSTRUCTIONS

WARNING

REMOVE BATTERY AND EXTERNAL POWER FROM AIRCRAFT PRIOR TO PERFORMING TECHNICAL BULLETIN INSTRUCTIONS.

NOTE

Refer to Bell Helicopter Model 407 Maintenance Manual and all applicable maintenance manuals and/or ICAs for disassembly/reassembly instructions not specifically addressed in this document.

1.0 FIBER OPTIC GYRO REMOVAL

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Remove the Hat Bin and Sound Proofing Blanket per BHT-407-MM-3 Maintenance Manual, Chapter 25.
3. Locate the existing Yaw Fiber Optic Gyro (FOG) on the Equipment Shelf and disconnect the electrical connector.
4. Remove the Screw (4) and Washer (4) which attach the FOG to the equipment shelf as shown in Figure 9. Retain hardware for re-installation.
5. Remove FOG from Equipment Shelf.

2.0 FIBER OPTIC GYRO INSTALLATION

1. Ensure that both the battery and external power have been removed from the aircraft.
2. Locate the 438-00100-021 Fiber Optic Gyro on the Equipment Shelf as shown in Figure 9.
3. Using the existing Inserts in the Equipment Shelf, attach the 438-00100-021 Fiber Optic Gyro using retained Screw (4) and Washer (4). Torque Screw (4) to 20-25 in-lbs.
4. Install the Yaw FOG electrical connector.
5. Perform Fiber Optic Gyro Operational Checks per Appendix E.
6. Install the Hat Bin and Sound Proofing Blanket per BHT-407-MM-3 Maintenance Manual, Chapter 25.
7. Annotate Log Book to show that Part III of this bulletin has been accomplished. Insert appropriate Automatic Flight Control System Supplement into the Flight Manual Supplement section of the Rotorcraft Flight Manual and update the Instructions for Continued Airworthiness per the Publications Required listed on Page 6.

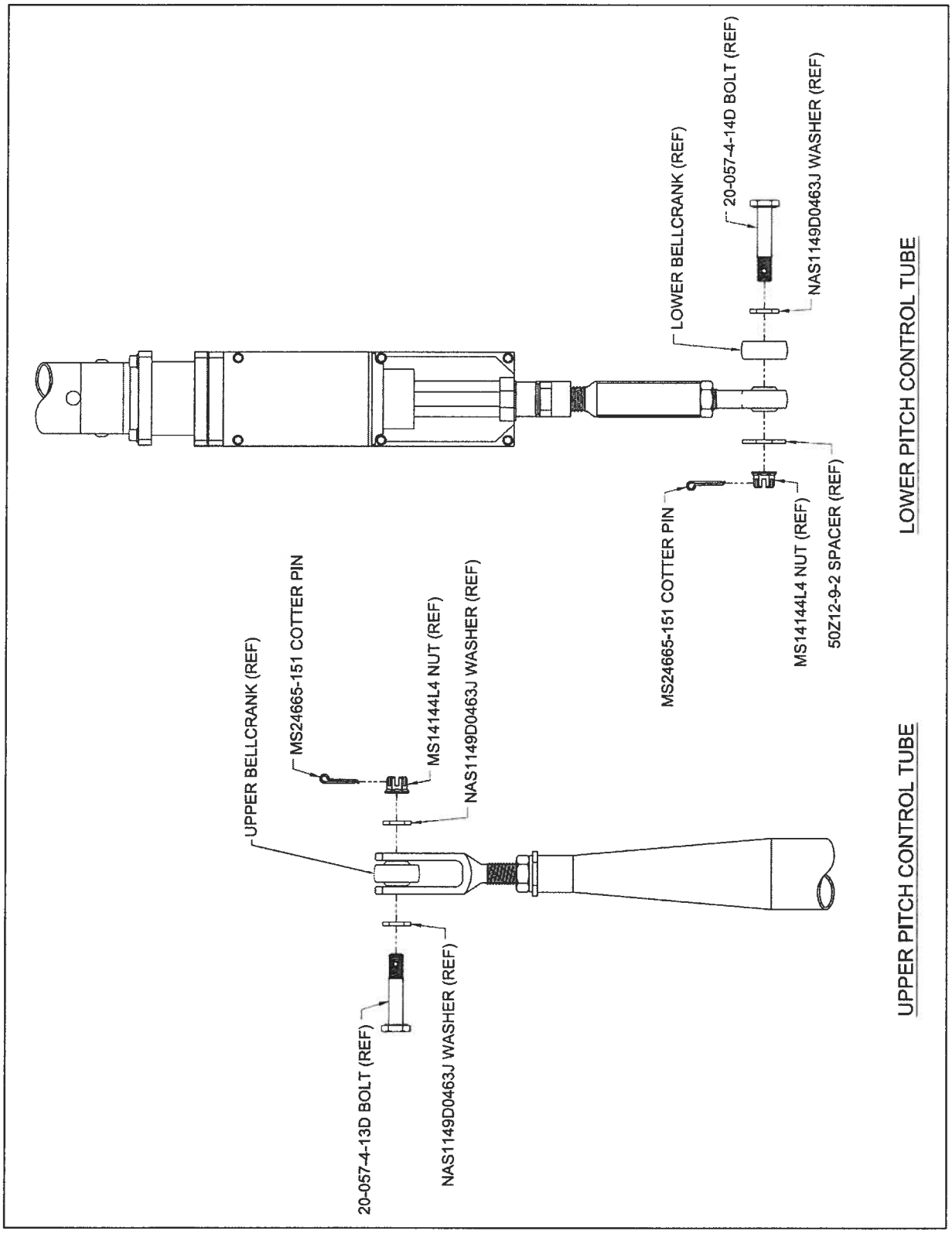

FIGURE 1 – Pitch Control Tube Attachment

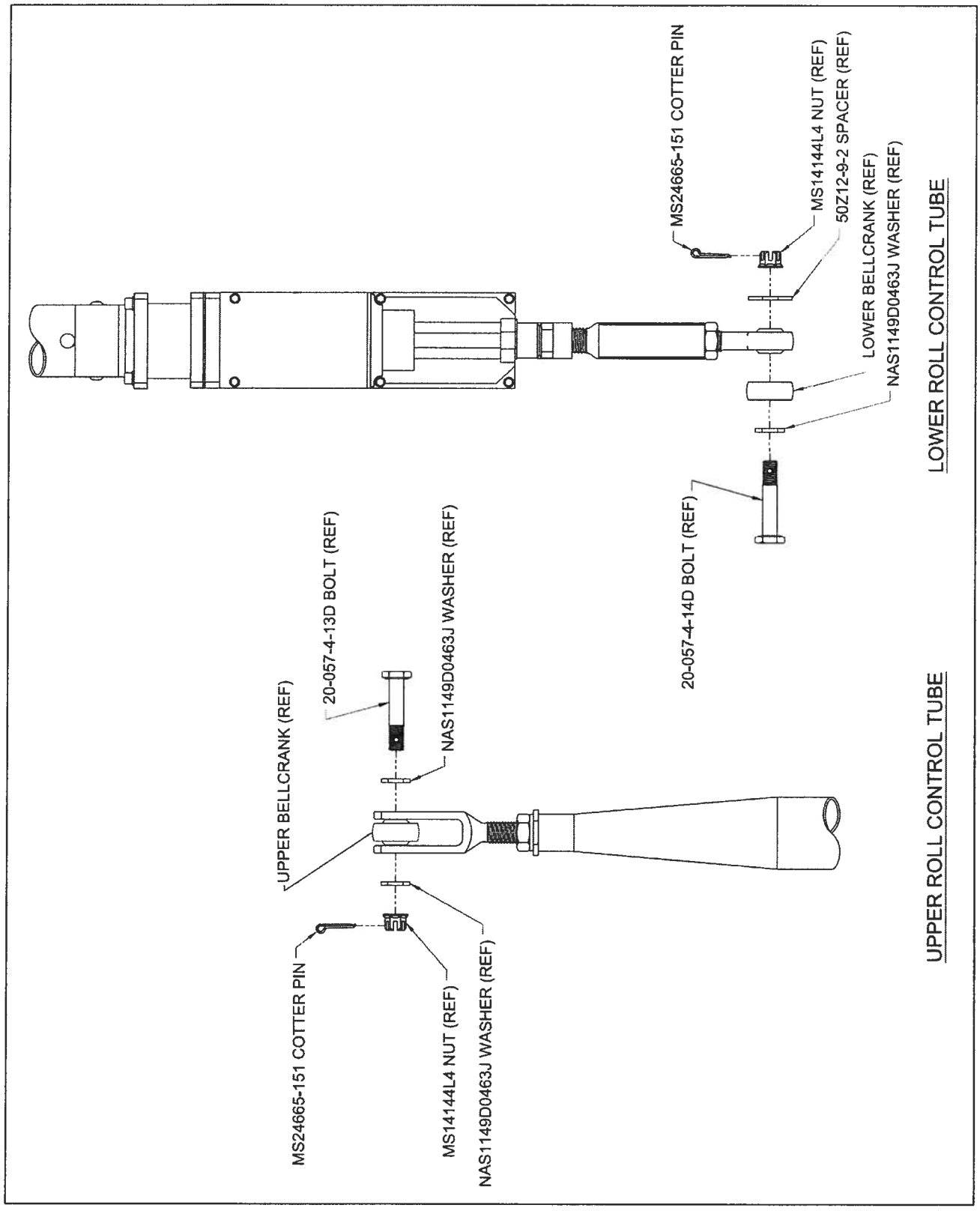

FIGURE 2 – Roll Control Tube Attachment

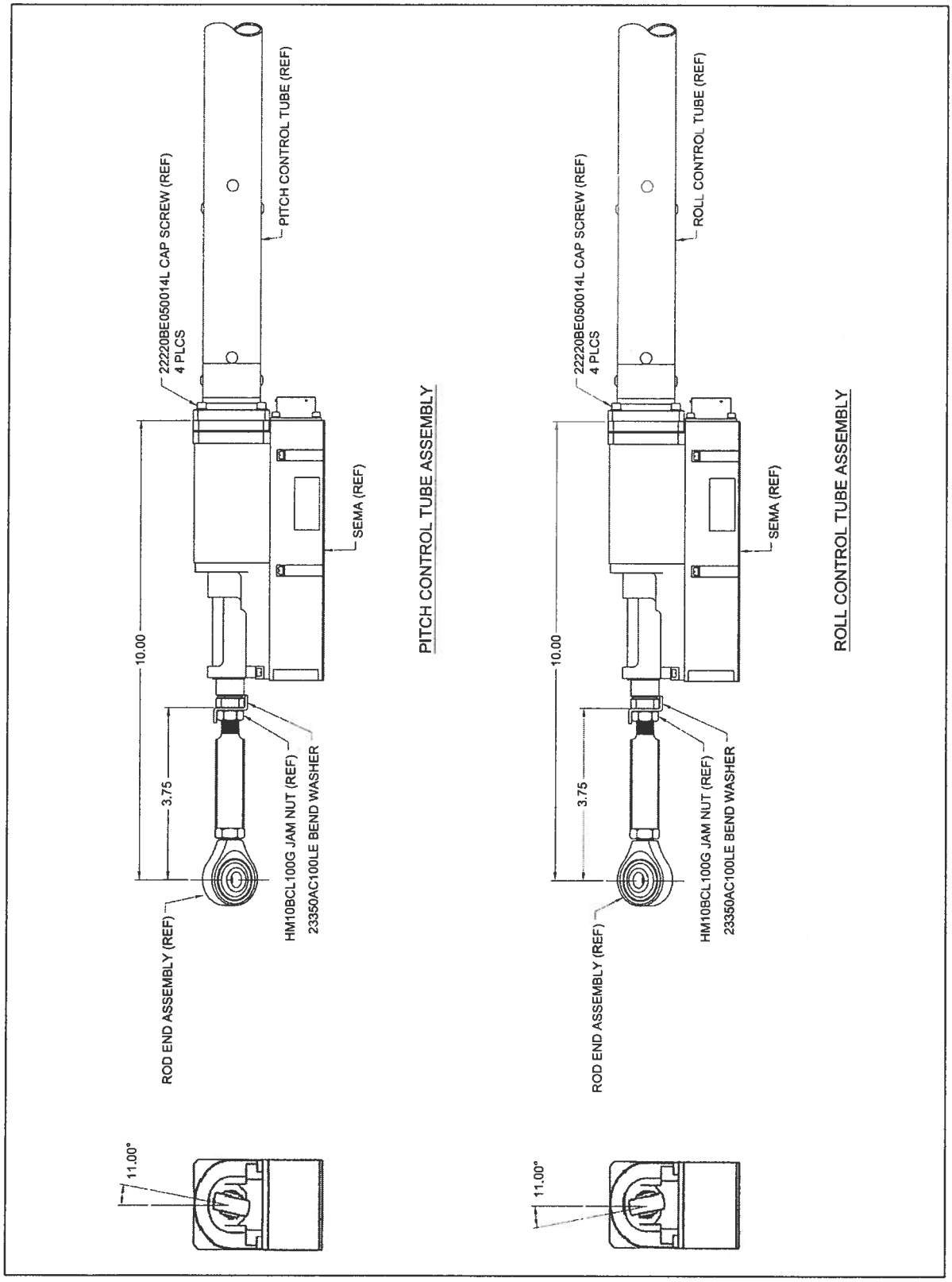

FIGURE 3 – Pitch and Roll SEMA Installation

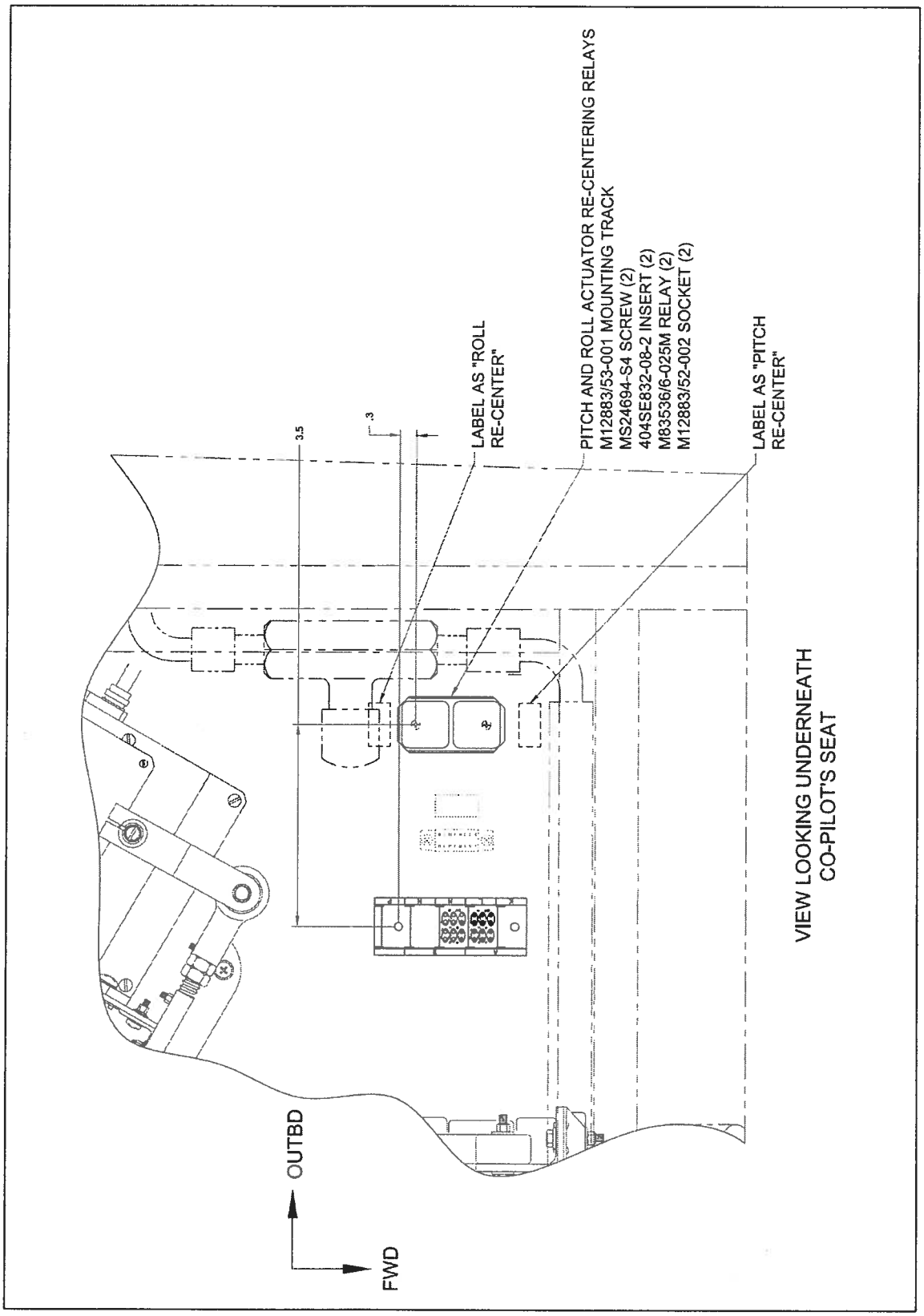

FIGURE 4 – SEMA Re-Centering Relay Installation

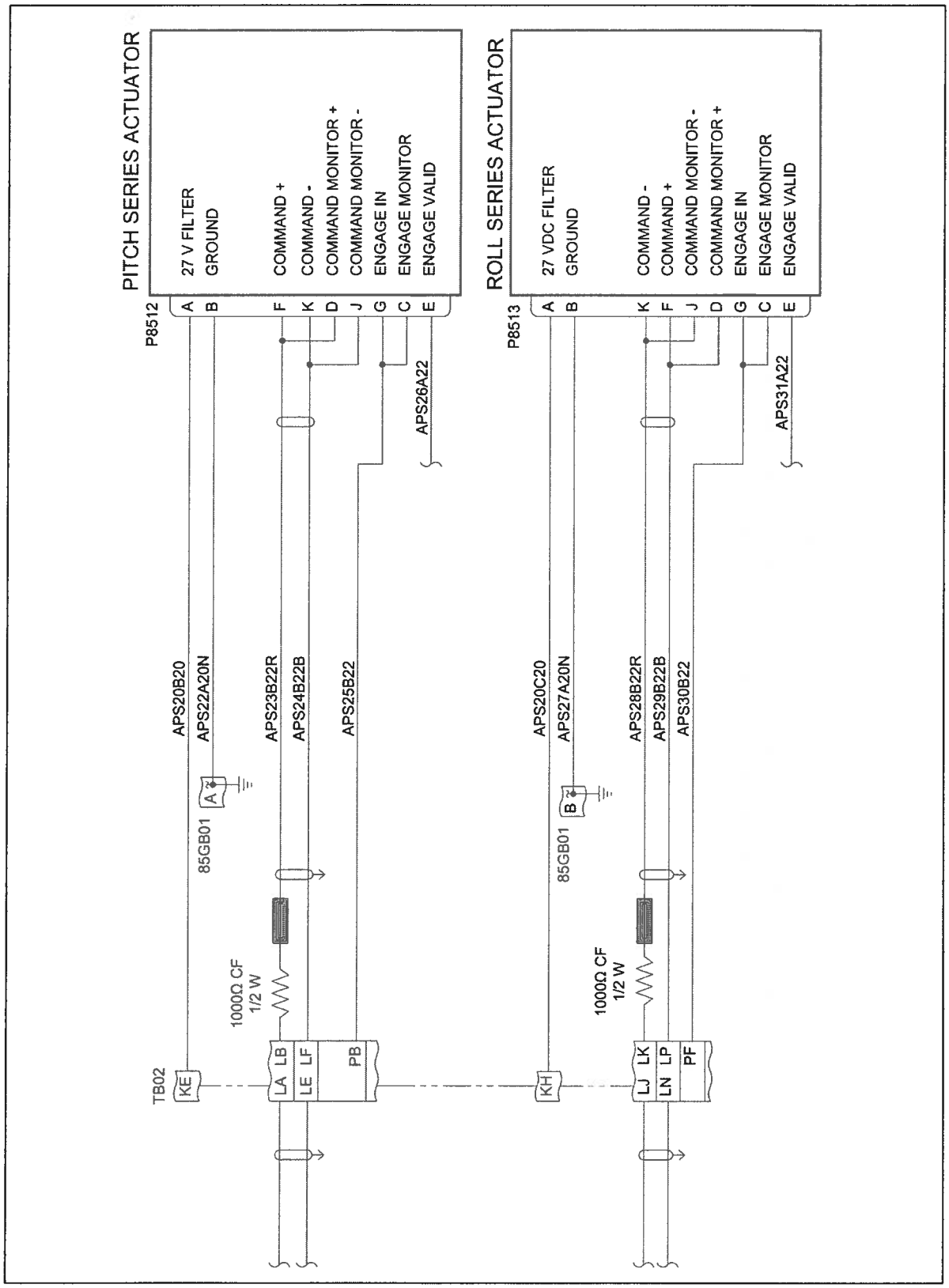

FIGURE 5 – Pre-Mod Pitch and Roll Actuator Wiring Diagram

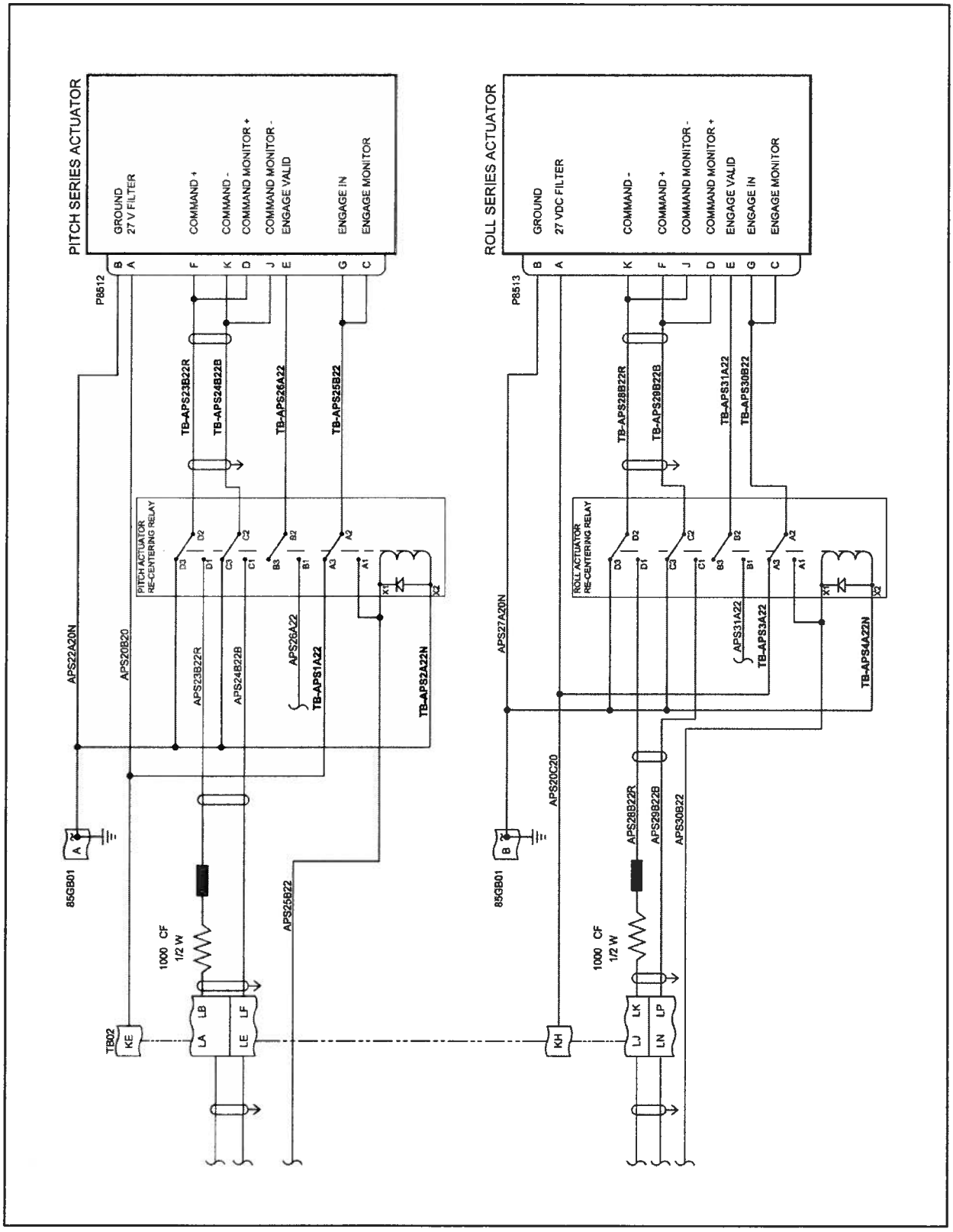

FIGURE 6 – Post-Mod Pitch and Roll Actuator Wiring Diagram

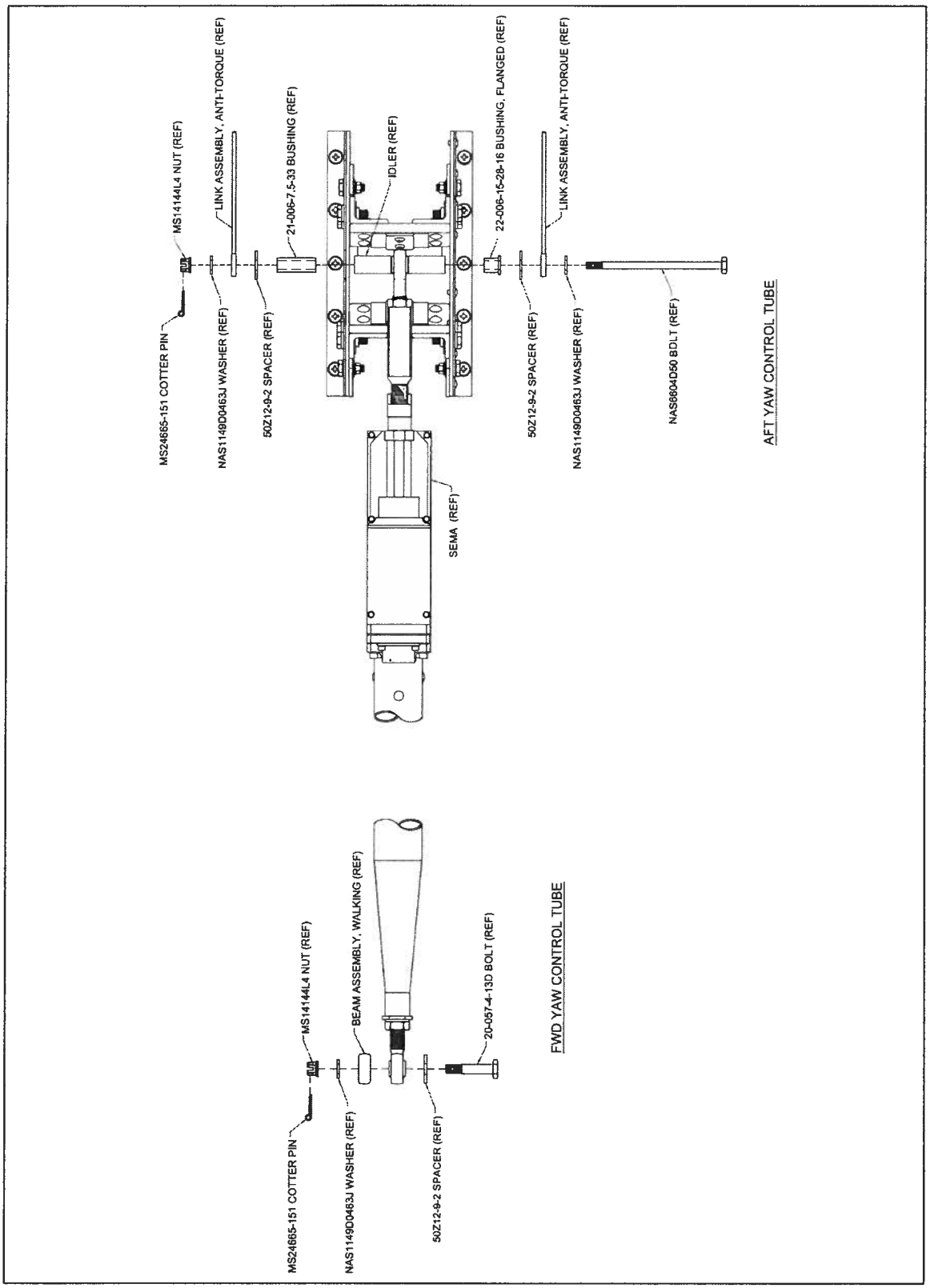

FIGURE 7 – Yaw Control Tube Attachment

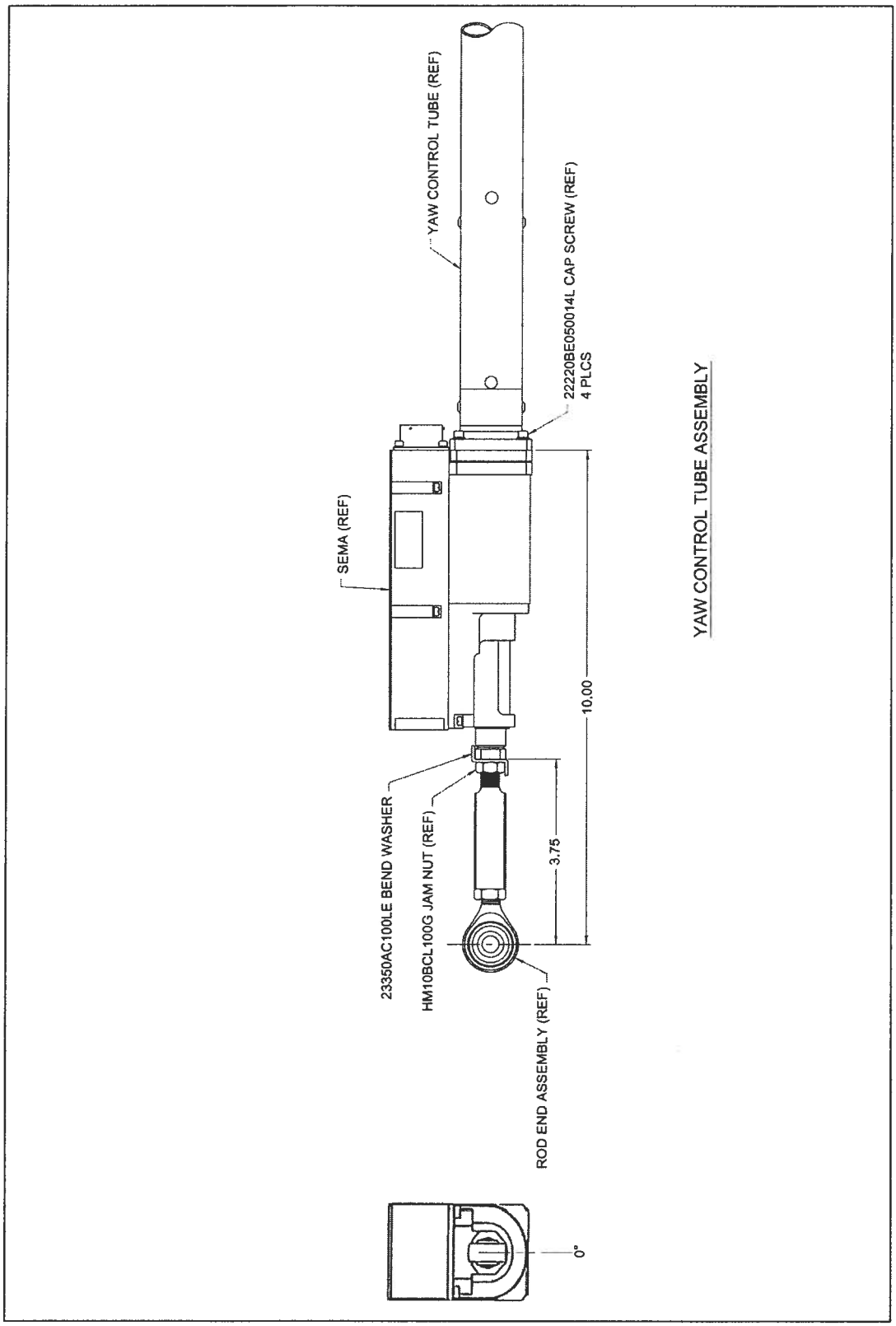

FIGURE 8 – Yaw SEMA Installation

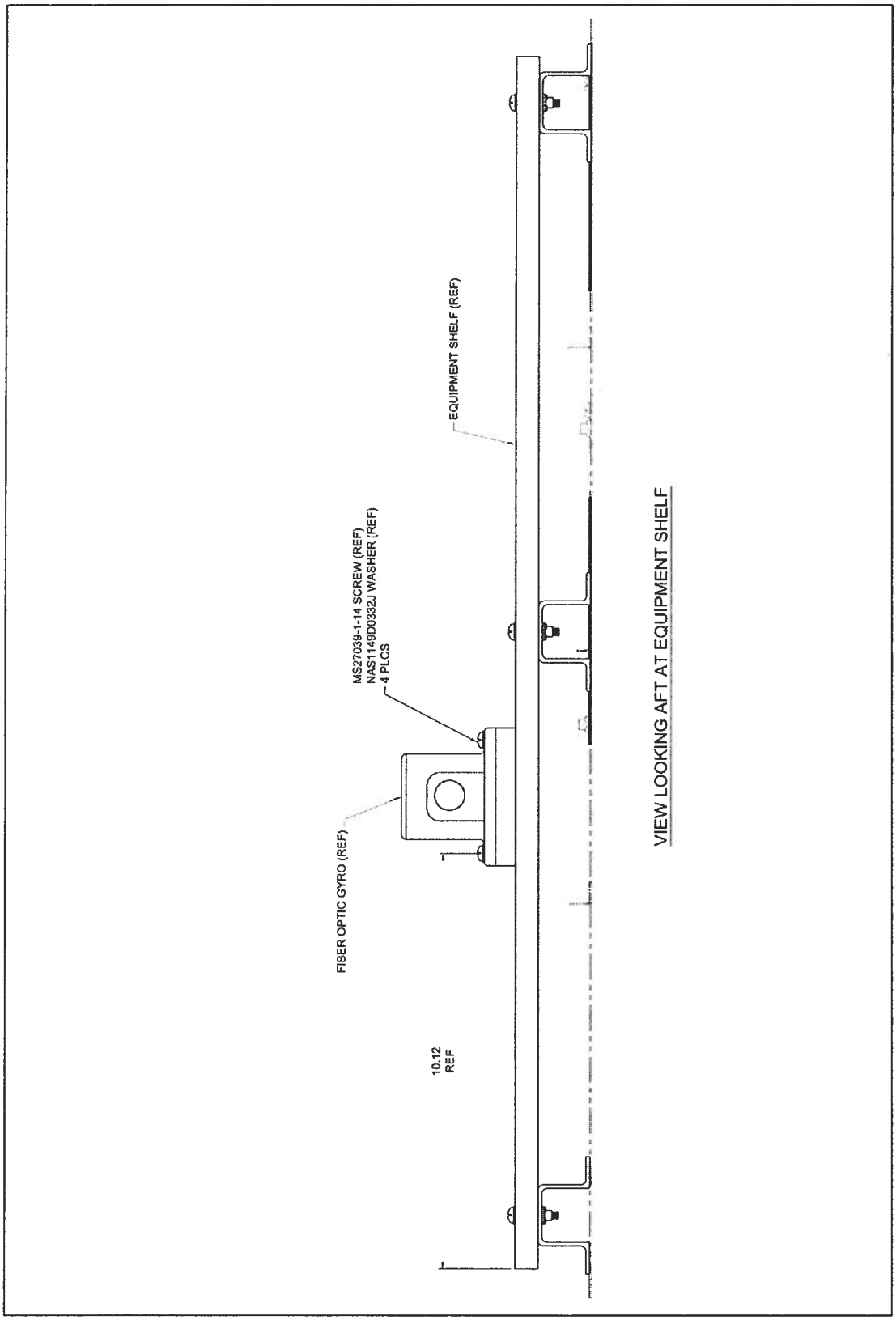

FIGURE 9 – Fiber Optic Gyro Installation

APPENDIX A

Pitch and Roll Cyclic Control Rigging

A1.0 PRIOR TO CYCLIC CONTROL RIGGING

1. Gain access to the Pitch and Roll SEMA.
2. If SEMA was installed on Control Tube in accordance with Part I - Section 2.0 Pitch and Roll SEMA Installation (Optional), ensure that both the Pitch and Roll SEMA are in the centered position by using the following procedure:
   a. Ensure that both the battery and external power have been removed from the aircraft.
   b. Remove the **GREEN** Pitch SEMA electrical connector and install the GTU 85-1 Ground Test Unit connector labeled PITCH on the Pitch SEMA.
   c. Remove the **RED** Roll SEMA electrical connector and install the GTU 85-1 Ground Test Unit connector labeled ROLL on the Roll SEMA.
   d. Connect GTU 85-1 Ground Test Unit to the aircraft's Aux 28VDC Power Supply located on the L/H side of the Center Console.
   e. Apply electrical power to the aircraft and set the AFCS circuit breaker.
   f. On the GU 85-1 Ground Test Unit set the Pitch and Roll SEMA Position Switch to the OFF (Center) position.
   g. Toggle the Pitch and Roll SEMA Power Switch to the ON position.
   h. Verify the proper overall dimension of 10.00 inch as shown in Figure 3.
   i. Pull the AFCS circuit breaker and remove electrical power from the aircraft.
   j. Remove the GTU 85-1 Ground Test Unit and re-install the **GREEN** Pitch SEMA electrical connector and the **RED** Roll SEMA electrical connector.

A2.0 CYCLIC CONTROL RIGGING

1. Rig the Cyclic Control System per BHT-407-MM-8 Maintenance Manual, Paragraph 67-50 Cyclic Control System – Rigging.

A3.0 AFTER CYCLIC CONTROL RIGGING

1. Gain access to the Pitch and Roll SEMA electrical connectors.
2. Install the GTU 85-1 Ground Test Unit by performing the following:
   a. Remove the **GREEN** Pitch SEMA electrical connector and install the GTU 85-1 Ground Test Unit connector labeled PITCH on the Pitch SEMA.
   b. Remove the **RED** Roll SEMA electrical connector and install the GTU 85-1 Ground Test Unit connector labeled ROLL on the Roll SEMA.
   c. Connect GTU 85-1 Ground Test Unit to the aircraft's Aux 28VDC Power Supply located on the L/H side on the Center Console.
3. Apply electrical and hydraulic power to the aircraft.

4. Turn on the Avionics Master and engage the Autopilot "P" pitch and "R" roll axes.
5. While inspecting the swashplate for contact between the swashplate inner ring and the swashplate Uniball support, use the GTU 85-1 Ground Test Unit to set the following Pitch and Roll SEMA positions. While the SEMAs are in each position, move the cyclic aft against its stop. Using a circular motion, move the cyclic through out its range of travel; pressing against the stops in all directions. No contact should be present in any condition.

Pitch SEMA extended	Roll SEMA centered
Pitch SEMA retracted	Roll SEMA centered
Pitch SEMA centered	Roll SEMA extended
Pitch SEMA centered	Roll SEMA retracted
Pitch SEMA extended	Roll SEMA extended
Pitch SEMA extended	Roll SEMA retracted
Pitch SEMA retracted	Roll SEMA extended
Pitch SEMA retracted	Roll SEMA retracted

6. Remove electrical and hydraulic power.
7. If no contact was present during the above test, remove the GTU 85-1 Ground Test Unit and re-install the **GREEN** Pitch SEMA electrical connector and the **RED** Roll SEMA electrical connector.
8. If contact was made re-check Cyclic Control Rigging.

APPENDIX B

Yaw Control Rigging

B1.0 PRIOR TO YAW CONTROL RIGGING

1. Gain access to the Yaw SEMA.
2. If SEMA was installed on Control Tube in accordance with Part II - Section 2.0 Yaw SEMA Installation (Optional), ensure that the Yaw SEMA is in the centered position by using the following procedure:
    a. Ensure that both the battery and external power have been removed from the aircraft.
    b. Install the Yaw SEMA electrical connector on the Yaw SEMA.
    c. Apply electrical power to the aircraft and set both the AFCS and Yaw SAS circuit breaker.
    d. Verify the proper overall dimension of 10.00 inch as shown in Figure 8.
    e. Pull the AFCS and Yaw SAS circuit breaker and remove electrical power from the aircraft.
3. Loosen the Yaw Control Adjustable Stops and move them away from the Bellcrank.

B2.0 YAW CONTROL RIGGING PROCEDURES

1. Rig the Yaw Control System per BHT-407-MM-8 Maintenance Manual, Paragraph 67-94 Directional Control Rigging

B3.0 AFTER YAW CONTROL RIGGING

1. Move and hold the Pilot's left Pedal forward firmly against the forward Stop Pin.
2. Move the left Pedal aft Adjustable Stop against the Bellcrank. Use two small blocks of wood or phenolic to protect the parts while clamping the Stop in place with a small clamp.
3. Ensure that the Pilot's left Pedal is held firmly in place and torque the 4 bolts for the left Pedal aft Adjustable Stop to 40 in-lbs and then remove the clamp and blocks.
4. Move and hold the Pilot's right Pedal forward firmly against the forward Stop Pin.
5. Move the right Pedal aft Adjustable Stop against the Bellcrank. Use two small blocks of wood or phenolic to protect the parts while clamping the Stop in place with a small clamp.
6. Ensure that the Pilot's right Pedal is held firmly in place and torque the 4 bolts for the right Pedal aft Adjustable Stop to 40 in-lbs and then remove the clamp and blocks.

APPENDIX C

Pitch and Roll SEMA Operational Checks

C1.0 PITCH AND ROLL AXIS CHECKOUT (WITHOUT FLIGHT DIRECTOR COUPLER)

Before applying aircraft power, pull the AFCS breaker, the force trim breaker, the Yaw SAS breaker (if applicable), and turn off the auto-trim switch and the force-trim switch. For safety, the auto-trim function is disabled while the aircraft is on the ground. This is accomplished via the weight on gear switch located on the forward cross tube. For testing purposes it will be necessary to activate the WOG switch by installing a suitable spacer between the switch actuator and switch plunger.

Apply electrical and hydraulic power.

NOTE

The force trim actuators provide some dampening to cyclic stick movement. Dampening is still present even if the force trim actuators are disengaged.

C1.1 PITCH AXIS CHECKOUT

NOTE

Before performing the following checks, make sure that the vertical gyro is erect and valid. It will also be necessary to visually monitor the pitch force trim actuator and pitch SEMA.

C1.1.1 PITCH AXIS ENGAGEMENT/DISENGAGEMENT AND AP FAIL ANNUNCIATION CHECKOUT (REFER TO FIGURE C-1)

1. Set the AFCS breaker. Engage the pitch axis by pressing the P button once on the autopilot control panel. Check that the P button is illuminated on the autopilot control panel. _____
2. Press the P button a second time. Check that the P button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. Engage the pitch axis by pressing the P button again. Check that the P button is illuminated. _____
3. Momentarily press the AP Disengage button on the pilot's cyclic grip. Check that the P button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
4. Repeat steps 2 and 3 using the copilot AP disengage button (if installed). _____

C1.1.2 PITCH AXIS AUTO TRIM AND FORCE DETECTOR CHECKOUT (REFER TO FIGURE C-2)

1. Engage the pitch axis. With the cyclic centered, use the beep trim switch to beep nose down for approximately 3 seconds. Visually check that the pitch SEMA extends. _____
2. Check that the cyclic starts moving forward slowly after approximately 4 seconds. _____

3. Listen carefully for pitch trim motor operation. Over-ride the pitch axis by moving the cyclic slightly forward or aft. This action activates the force detector and disables the auto-trim. Check that the pitch force trim actuator motor is no longer running. _____
4. Release the pressure on the cyclic. Check that the cyclic starts moving forward slowly again. _____
5. Using the force trim release button, re-center the cyclic. While re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. This action re-synchronizes the pitch axis memory in the AP computer. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____
6. Use the beep trim switch and beep nose up for approximately 3 seconds. Visually check that the pitch SEMA retracts. _____
7. Visually check that the cyclic starts moving aft slowly after approximately 4 seconds. _____
8. Using the force trim release button re-center the cyclic. Again, while re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. After the cyclic is centered and the force trim release button is released check that the cyclic is no longer moving. _____

C1.1.3 PITCH AXIS TRIM TEST CHECKOUT (REFER TO FIGURE C-3)

NOTE

The trim test function will not work if the force detector is activated.

1. With the pitch axis engaged, press and hold the trim test button. After approximately 7 seconds check that the TRIM-FAIL annunciator starts flashing and the cyclic starts moving slowly aft in small steps. _____
2. Release the trim test button and re-center the cyclic. _____

C1.1.4 PITCH AXIS ATTITUDE REFERENCE CHECKOUT (REFER TO FIGURE C-4)

NOTE

For this check it will be necessary to have the attitude reference sensor unsecured from its rack so that it can be tilted in both directions. Proper actuator and trim response depends on proper phase relation between the AC reference on P852 and the Pitch Hi and Lo input on P851. Pitch Hi and Lo may be swapped to achieve desired actuator response.

1. With the pitch axis engaged and the cyclic centered, tilt the attitude reference sensor so that it simulates an aircraft nose down attitude. Check that after approximately 4 seconds the cyclic starts moving slowly aft. _____
2. Place the attitude reference sensor flat and re-center the cyclic. _____

3. Now tilt the attitude reference so that it simulates an aircraft nose up attitude. Check that after approximately 4 seconds the cyclic starts moving slowly forward. _____
4. Place the attitude reference sensor back in its rack but do not secure it yet. _____
5. Disengage the pitch axis and re-center the cyclic. _____

C1.2 ROLL AXIS CHECKOUT

NOTE

Before performing the following checks, make sure that the vertical gyro is erect and valid. It will also be necessary to visually monitor the roll force trim actuator and roll SEMA.

C1.2.1 ROLL AXIS ENGAGEMENT/DISENGAGEMENT AND AP FAIL ANNUNCIATION CHECKOUT (REFER TO FIGURE C-5)

1. Engage the roll axis by pressing the R button once on the autopilot control panel. Check that the R button is illuminated on the autopilot control panel. _____
2. Press the R button a second time. Check that the R button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
3. Engage the roll axis by pressing the R button again. Check that the R button is illuminated. _____
4. Disengage the roll axis by momentarily pressing the AP disengage button on the cyclic grip. Check that the R button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
5. Repeat steps 3 & 4 using the copilot AP disengage button (if installed). _____

C1.2.2 ROLL AXIS AUTO TRIM AND FORCE DETECTOR CHECKOUT (REFER TO FIGURE C-6)

1. Engage the roll axis and beep roll left for approximately 3 seconds. Visually verify that the roll SEMA extends. _____
2. Check that the cyclic starts moving left slowly after approximately 4 seconds. _____
3. Listen carefully for roll trim motor operation. Over-ride the roll axis by moving the cyclic slightly left or right. This action activates the force detector and disables the auto-trim. Check that the roll force trim actuator motor is no longer running. _____
4. Release the pressure on the cyclic. Check that the cyclic starts moving left again. _____

5. Using the force trim release button re-center the cyclic. While re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. This action re-synchronizes the roll axis memory in the AP computer. _____
6. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____
7. Use the beep trim switch and beep roll right for approximately 3 seconds. Visually verify that the roll SEMA retracts. _____
8. Check that the cyclic starts moving right slowly after approximately 4 seconds. _____
9. Using the force trim release button re-center the cyclic. Again, while re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. _____
10. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____

C1.2.3 ROLL AXIS TRIM TEST CHECKOUT (REFER TO FIGURE C-7)

NOTE

The trim test function will not work if the force detector is activated.

1. With the roll axis engaged, press and hold the trim test button. After approximately 7 seconds check that the TRIM-FAIL annunciator starts flashing and that the cyclic starts moving slowly left. _____
2. Release the trim test button and re-center the cyclic. _____

C1.2.4 ROLL AXIS ATTITUDE REFERENCE CHECKOUT (REFER TO FIGURE C-8)

NOTE

For this check it will be necessary to have the Attitude Reference Sensor unsecured from its rack so that it can be tilted in both directions. Proper Actuator and Trim response depends on the proper phase relation between the AC reference on P852 and Roll Hi and Lo inputs on P851. Roll Hi and Lo may be swapped to achieve the desired Actuator response.

1. With the roll axis engaged and the cyclic centered, tilt the attitude reference sensor so that it simulates an aircraft roll left attitude. Check that after approximately 4 seconds the cyclic starts moving slowly right. _____
2. Place the attitude reference sensor flat and re-center the cyclic. _____

3. Now tilt the attitude reference so that it simulates an aircraft roll right attitude. Check that after approximately 4 seconds the cyclic starts moving slowly left. _____

4. Place the attitude reference sensor back in its rack and secure it. Re-center the cyclic. _____

C1.2.5 HEADING SELECT (HDG) CHECKOUT (REFER TO FIGURE C-9)

NOTE

For this check it will be necessary that the HSI is valid.

1. Set the heading bug under the lubber line. With the roll axis engaged and the cyclic centered, engage heading select by pressing the HDG button on the autopilot control panel once. Check that the HDG button is illuminated. _____
2. Rotate the heading bug to the left by at least 10 degrees. Check that after approximately 4 seconds the cyclic starts moving left slowly. _____
3. Set the heading bug back to the lubber line and re-center the cyclic. _____
4. Rotate the heading bug to the right by at least 10 degrees. Check that after approximately 4 seconds the cyclic starts moving right slowly. _____
5. Disengage heading select by pressing the HDG button on the autopilot control panel. Check that the HDG button is no longer illuminated. _____
6. Re-center the cyclic and disengage the roll axis. Check that the AP FAIL annunciator flashes for approximately 10 seconds. _____

C1.3 CONCLUSION

1. Remove electrical and hydraulic power from the helicopter. _____
2. Remove the spacer from the WOG switch. _____
3. Perform the necessary inspections on all areas opened to perform this test. _____
4. Perform any additional tests and inspections necessary to confirm that the helicopter is in an airworthy condition in preparation for flight. _____

C2.0 PITCH AND ROLL AXIS CHECKOUT (WITH CDV-85 FLIGHT DIRECTOR COUPLER)

Before applying aircraft power, pull the AFCS breaker, the force trim breaker, the Yaw SAS breaker (if applicable), and turn off the auto-trim switch and the force trim switch. For safety, the auto-trim function is disabled while the aircraft is on the ground. This is accomplished via the weight on gear switch located on the forward cross tube. For testing purposes it will be necessary to activate the WOG switch by installing a suitable spacer between the switch actuator and switch plunger.

Apply electrical and hydraulic power.

NOTE

The force trim actuators provide some dampening to cyclic stick movement. Dampening is still present even if the force trim actuators are disengaged.

C2.1 PITCH AXIS CHECKOUT

NOTE

Before performing the following checks, make sure that the vertical gyro is erect and valid. It will also be necessary to visually monitor the pitch force trim actuator and pitch SEMA.

C2.1.1 PITCH AXIS ENGAGEMENT/DISENGAGEMENT AND AP FAIL ANNUNCIATION CHECKOUT (REFER TO FIGURE C-10)

1. Set the AFCS breaker. Engage the pitch axis by pressing the P button once on the AP/CDV control panel. Check that the P button is illuminated on the AP/CDV control panel. _____
2. Press the P button a second time. Check that the P button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
3. Engage the pitch axis by pressing the P button again. Check that the P button is illuminated. _____
4. Momentarily press the AP disengage button on the pilots cyclic grip. Check that the P button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
5. Repeat steps 3 and 4 using the copilot AP disengage button (if installed). _____

C2.1.2 PITCH AXIS AUTO TRIM AND FORCE DETECTOR CHECKOUT (REFER TO FIGURE C-11)

1. Engage the pitch axis. With the cyclic centered, use the beep trim switch to beep nose down for approximately 3 seconds. Visually check that the pitch SEMA extends. _____
2. Check that the cyclic starts moving forward slowly after approximately 4 seconds. _____
3. Listen carefully for pitch trim motor operation. Over-ride the pitch axis by moving the cyclic slightly forward or aft. This action activates the force detector and disables the auto-trim. Check that the pitch force trim actuator motor is no longer running. _____
4. Release the pressure on the cyclic. Check that the cyclic starts moving forward slowly again. _____
5. Using the force trim release button, re-center the cyclic. While re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. This action re-synchronizes the pitch axis memory in the AP computer. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____
6. Use the beep trim switch and beep nose up for approximately 3 seconds. Visually check that the pitch SEMA retracts. _____
7. Check that the cyclic starts moving aft slowly after approximately 4 seconds. _____
8. Using the force trim release button re-center the cyclic. Again, while re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. After the cyclic is centered and the force trim release button is released check that the cyclic is no longer moving. _____

C2.1.3 PITCH AXIS TRIM TEST CHECKOUT (REFER TO FIGURE C-12)

NOTE

The trim test function will not work if the force detector is activated.

1. With the pitch axis engaged, press and hold the trim test button. After approximately 7 seconds check that the TRIM-FAIL annunciator starts flashing and the cyclic starts moving slowly aft in small steps. _____
2. Release the trim test button and re-center the cyclic. _____

C2.1.4 PITCH AXIS ATTITUDE REFERENCE CHECKOUT (REFER TO FIGURE C-13)

NOTE

For the check it will be necessary to have the Attitude Reference Sensor unsecured from its rack so that it can be tilted in both directions. Proper Actuator, Trim, and Command Bar response depends on the proper phase relation between the AC reference on P852 and P856 and the Pitch Hi and Lo input on P851 and P856. Pitch Hi and Lo may be swapped to achieve the desired Actuator response.

1. With the pitch axis engaged and the cyclic centered, tilt the attitude reference sensor so that it simulates an aircraft nose down attitude. Check that after approximately 4 seconds the cyclic starts moving slowly aft. _____
2. Place the attitude reference sensor flat and re-center the cyclic. _____
3. Now tilt the attitude reference so that it simulates an aircraft nose up attitude. Check that after approximately 4 seconds the cyclic starts moving slowly forward. _____
4. Place the attitude reference sensor back in its rack but do not secure it yet. _____
5. Re-center the cyclic and disengage the autopilot. _____

C2.2 ROLL AXIS CHECKOUT

NOTE

Before performing the following checks, make sure that the vertical gyro is erect and valid. It will also be necessary to visually monitor the roll force trim actuator and the roll SEMA.

C2.2.1 ROLL AXIS ENGAGEMENT/DISENGAGEMENT AND AP FAIL ANNUNCIATION CHECKOUT (REFER TO FIGURE C-14)

1. Engage the roll axis by pressing the R button once on the AP/CDV control panel. Check that the R button is illuminated on the AP/CDV control panel. _____
2. Press the R button a second time. Check that the R button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
3. Engage the roll axis by pressing the R button again. Check that the R button is illuminated. _____
4. Disengage the roll axis by momentarily pressing the AP disengage button on the cyclic grip. Check that the R button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
5. Repeat steps 3 & 4 using copilot AP disengage button (if installed). _____

C2.2.2 ROLL AXIS AUTO TRIM AND FORCE DETECTOR CHECKOUT (REFER TO FIGURE C-15)

1. Beep roll left for approximately 3 seconds. Visually check that the roll SEMA retracts. _____
2. Check that the cyclic starts moving left slowly after approximately 4 seconds. _____
3. Listen carefully for roll trim motor operation. Override the roll axis by moving the cyclic slightly left or right. This action activates the force detector and disables the auto-trim. Check that the roll force trim actuator motor is no longer running. _____
4. Release the pressure on the cyclic. Check that the cyclic starts moving left again. _____
5. Using the force trim release button re-center the cyclic. While re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. This action re-synchronizes the roll axis memory in the AP computer. _____
6. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____
7. Use the beep trim switch and beep roll right for approximately 3 seconds. Visually check that the roll SEMA extends. _____
8. Check that the cyclic starts moving right slowly after approximately 4 seconds. _____
9. Using the force trim release button re-center the cyclic. Again, while re-centering the cyclic make sure that the force trim release button is pressed for at least 5 seconds. _____
10. After the cyclic is re-centered and the force trim release button is released check that the cyclic is no longer moving. _____

C2.2.3 ROLL AXIS TRIM TEST CHECKOUT (REFER TO FIGURE C-16)

NOTE

The trim test function will not work if the force detector is activated.

1. With the roll axis engaged, press and hold the trim test button. After approximately 7 seconds check that the TRIM-FAIL annunciator starts flashing and that the cyclic starts moving slowly left. _____
2. Release the trim test button and re-center the cyclic. _____

C2.2.4 ROLL AXIS ATTITUDE REFERENCE CHECKOUT (REFER TO FIGURE C-17)

NOTE

For this check it will be necessary to have the Attitude Reference Sensor unsecured from its rack so that it can be tilted in both directions. Proper Actuator and Trim response depends on the proper phase relation between the AC reference on P852 and P856 and the Roll Hi and Lo inputs on P851 and P856. Roll Hi and Lo may be swapped to achieve the desired Actuator response.

1. Set the heading bug under the lubber line. Engage the roll axis and center the cyclic. Engage F/D and HDG. DO NOT engage CPL. Tilt the attitude reference sensor so that it simulates an aircraft roll left attitude. Check that the roll command bar moves right, and after approximately 4 seconds the cyclic starts moving slowly right. _____
2. Place the attitude reference sensor flat and re-center the cyclic. _____
3. Now tilt the attitude reference so that it simulates an aircraft roll right attitude. Check that after approximately 4 seconds the cyclic starts moving slowly left. ___
4. Disengage heading. Place the Attitude Reference Sensor back in its rack and secure it. Re-center the cyclic. _____

C2.2.5 HEADING SELECT (HDG) CHECKOUT (REFER TO FIGURE C-18)

NOTE

For this check it will be necessary that the HSI is valid.

1. Check that roll is engaged and that the cyclic is centered. Engage F/D and CPL. Set the heading bug under the lubber line. _____
2. Engage heading select by pressing the HDG button once on the AP/CDV control panel. _____
3. Check that the HDG button is illuminated and that the roll F/D bar comes into view and stabilizes at the zero reference point. _____
4. Rotate the heading bug to the left by at least 10 degrees. Check that after approximately 4 seconds the cyclic starts moving left slowly and that the roll F/D bar indicates a roll left command. _____
5. Set the heading bug back to the lubber line and re-center the cyclic. _____
6. Rotate the heading bug to the right by at least 10 degrees. Check that after approximately 4 seconds the cyclic starts moving right slowly and that the roll F/D bar indicates a roll right command. _____

7. Set the heading bug back to the lubber line and re-center the cyclic. _____
8. Disengage heading select by pressing the HDG button again on the AP/CDV control panel. Check that the HDG button is no longer illuminated and that the CPLD annunciator flashes for approximately 10 seconds. _____

C2.3 CONCLUSION

1. Remove electrical and hydraulic power from the helicopter. _____
2. Remove the spacer from the WOG switch. _____
3. Perform the necessary inspections on all areas opened to perform this test. _____
4. Perform any additional tests and inspections necessary to confirm that the helicopter is in an airworthy condition in preparation for flight. _____

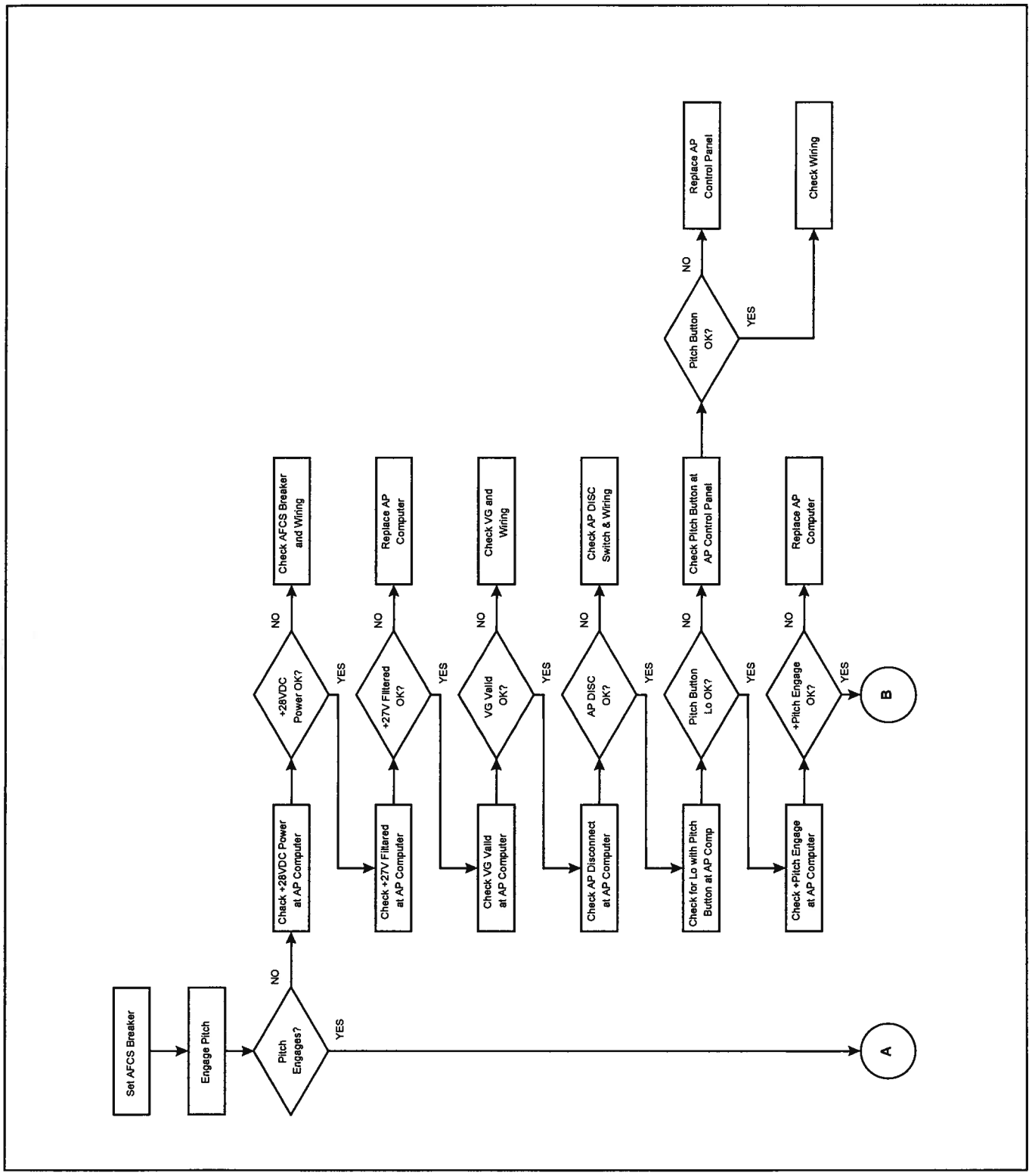

FIGURE C-1 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ENGAGEMENT/DISENGAGEMENT (SHEET 1 OF 2)

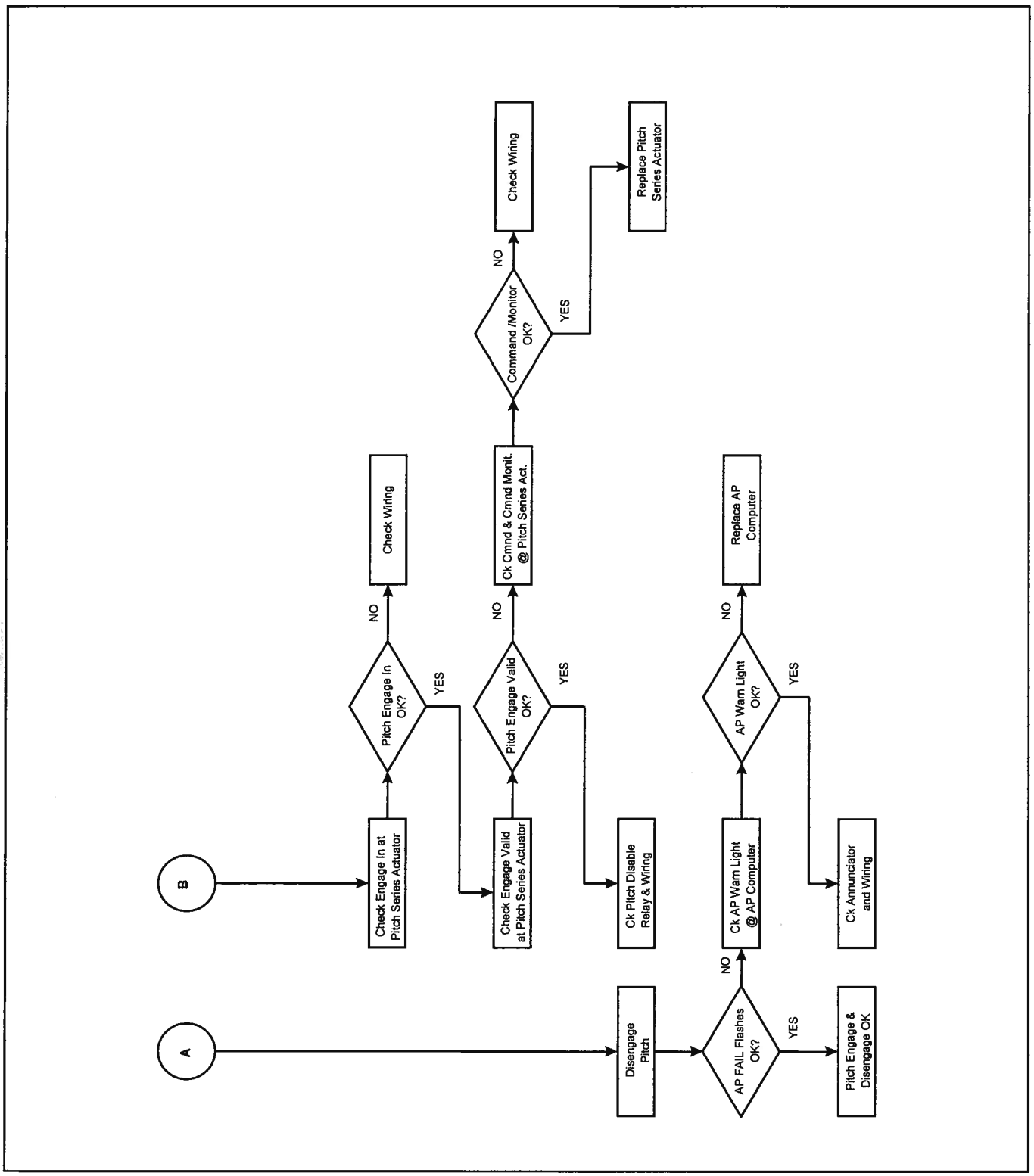

FIGURE C-1 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ENGAGEMENT/DISENGAGEMENT (SHEET 2 OF 2)

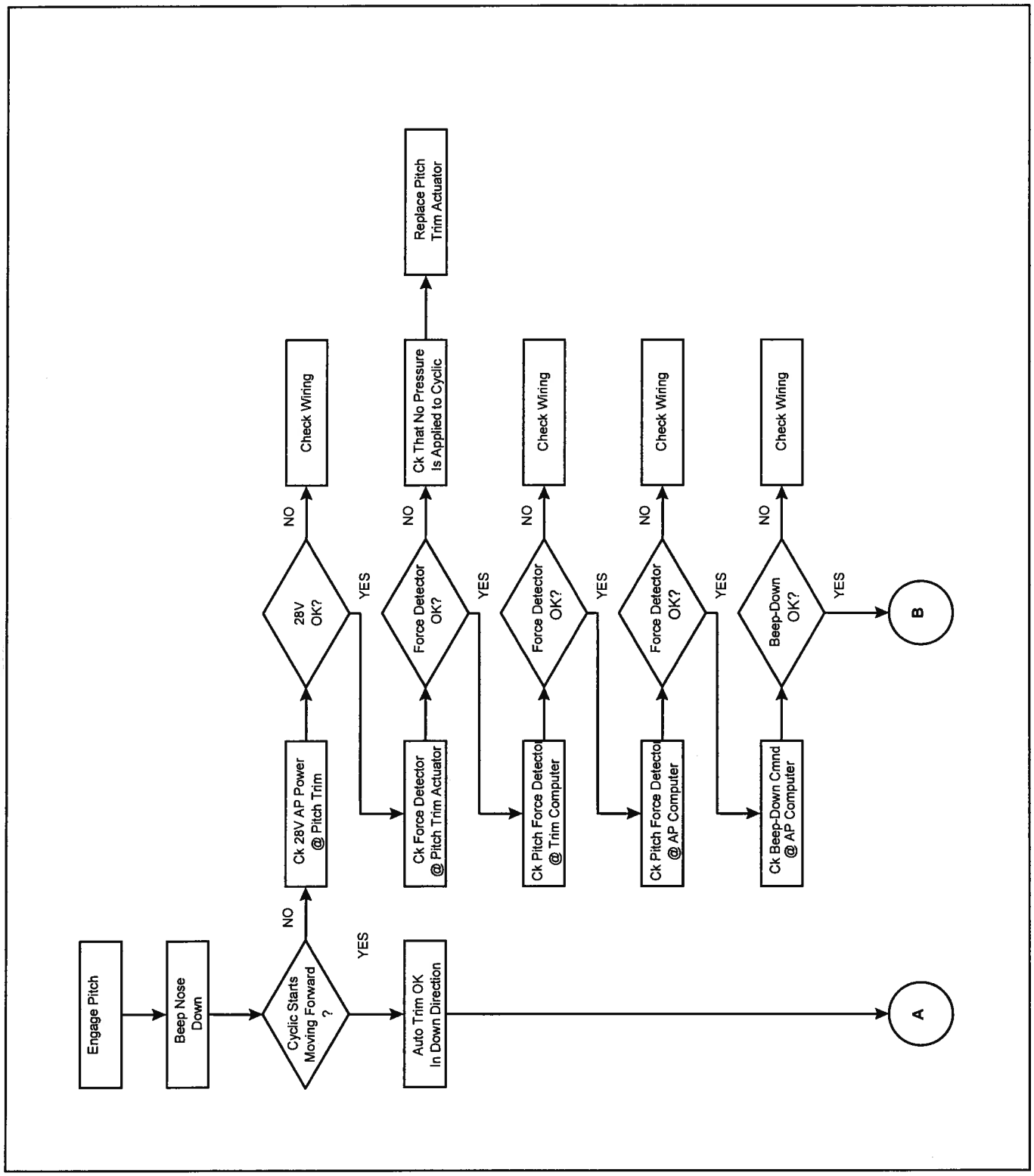

FIGURE C-2 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 1 OF 3)

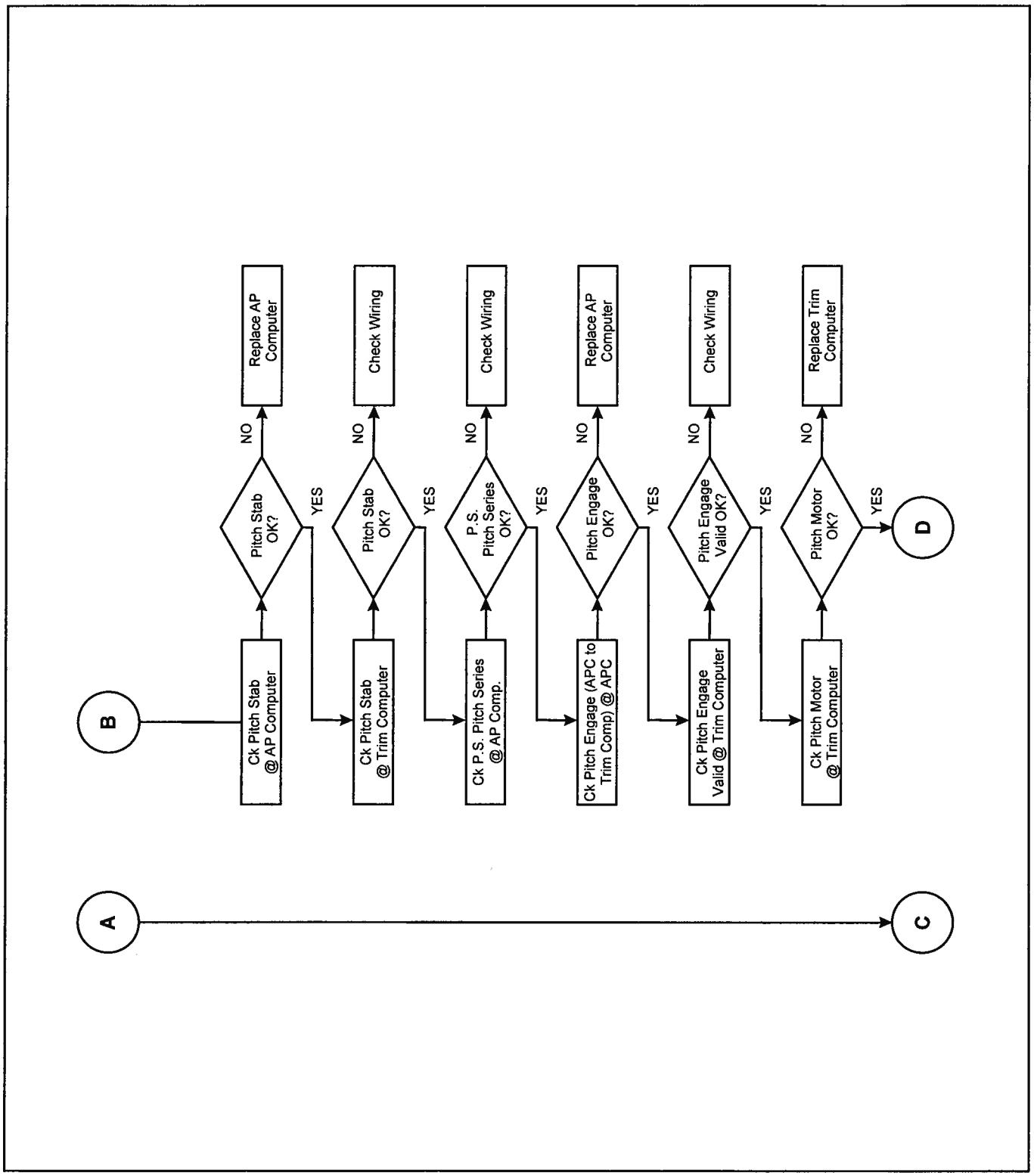

FIGURE C-2 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 2 OF 3)

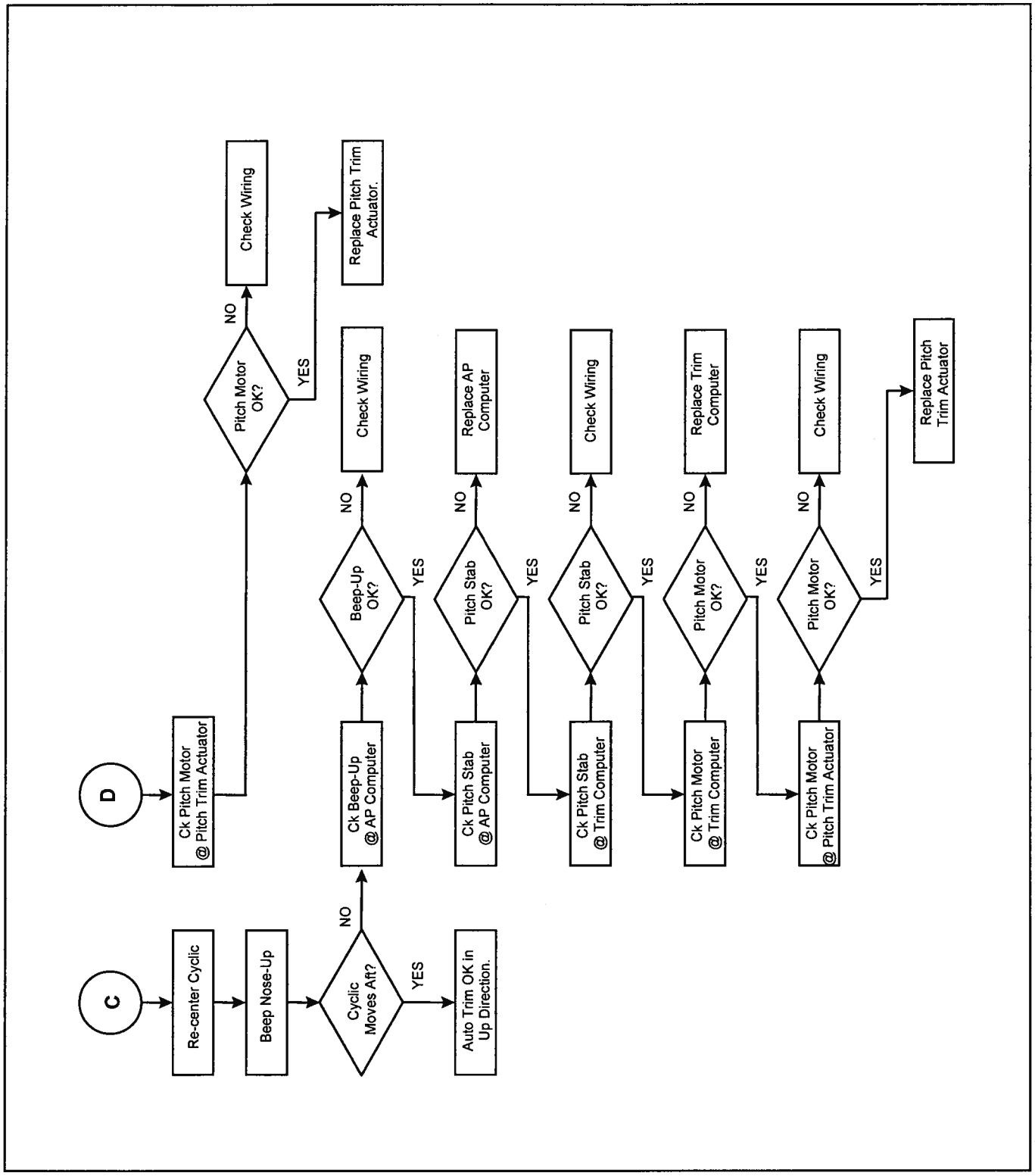

FIGURE C-2 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 3 OF 3)

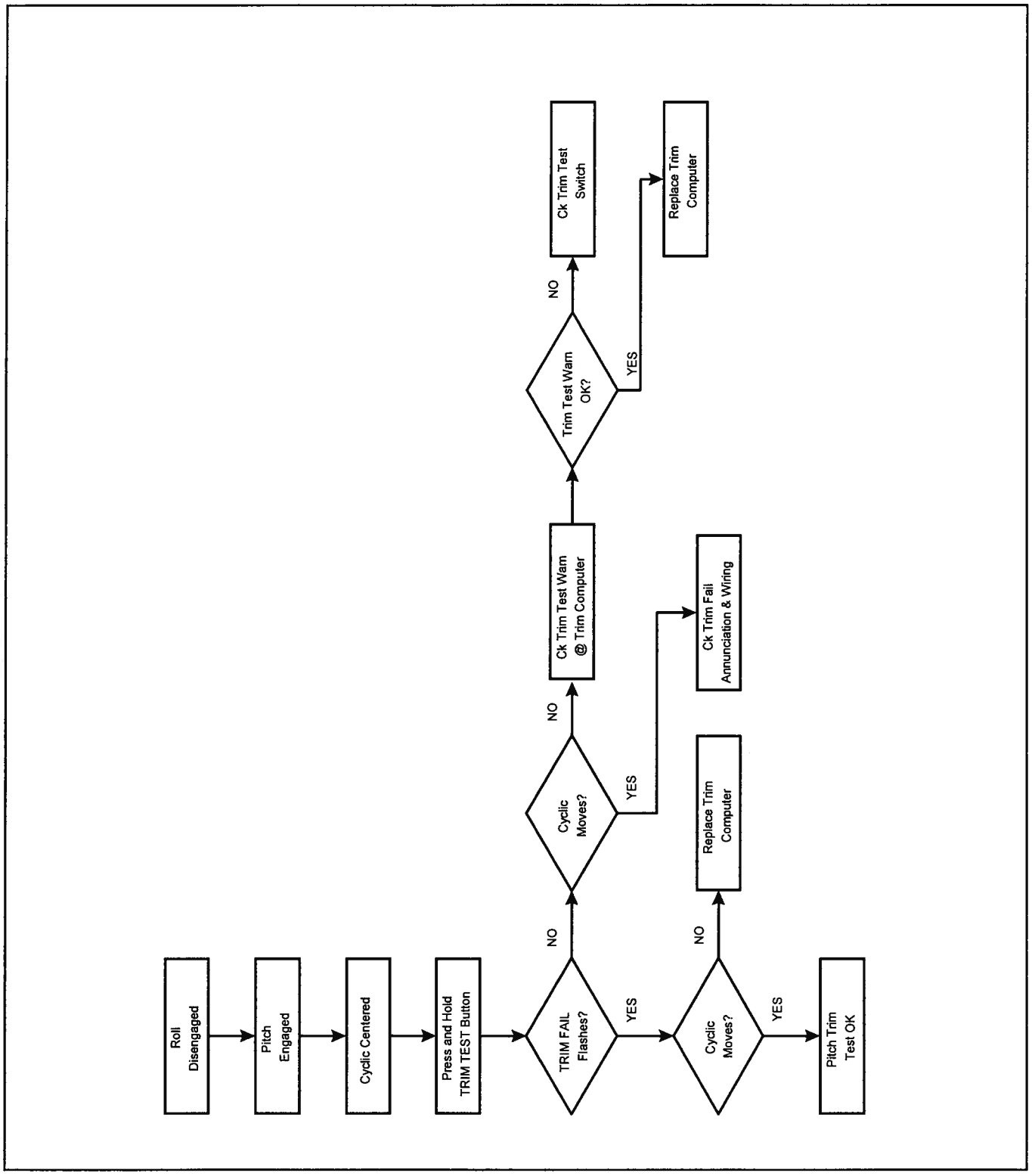

FIGURE C-3 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH TRIM TEST

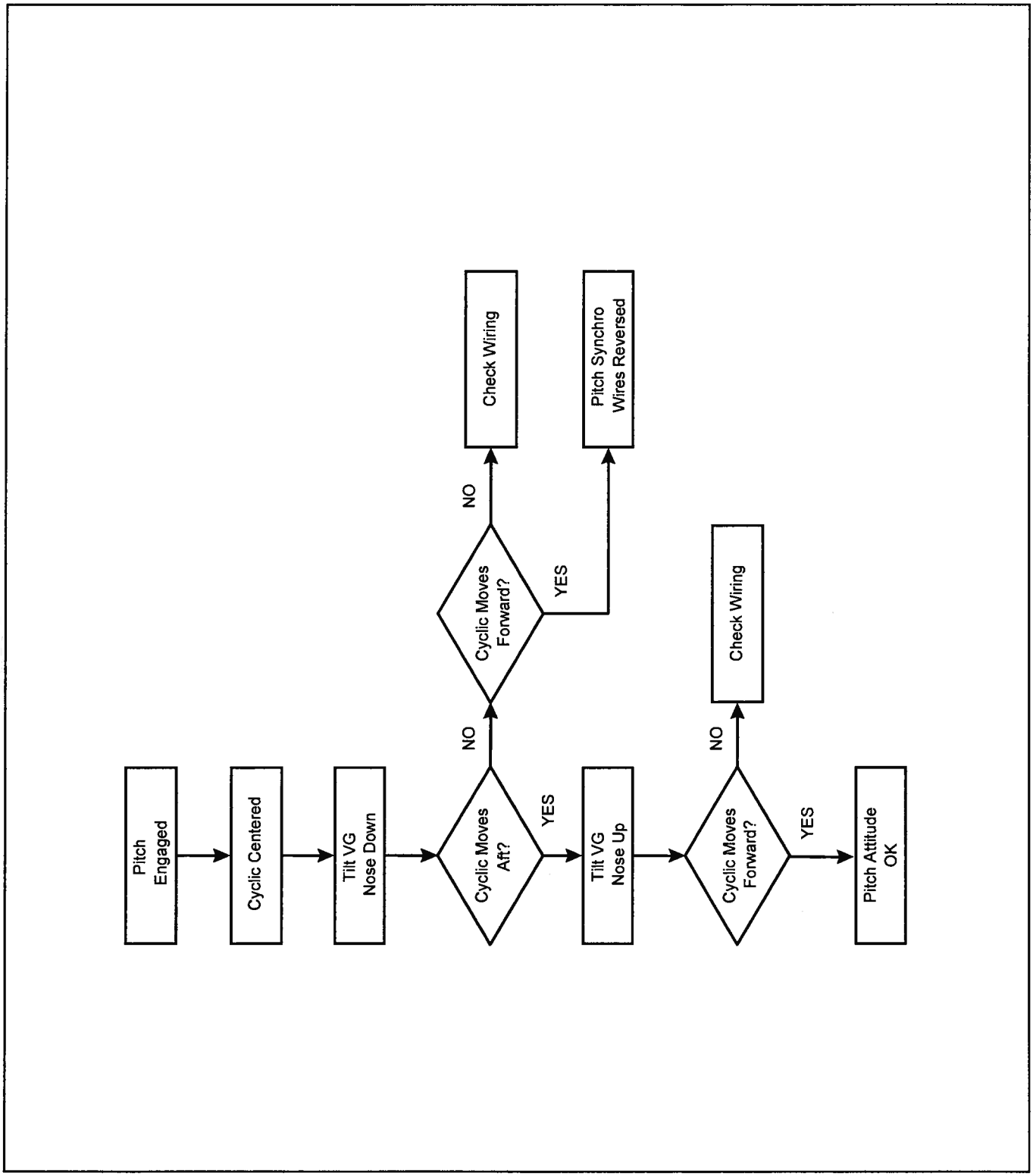

FIGURE C-4 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ATTITUDE

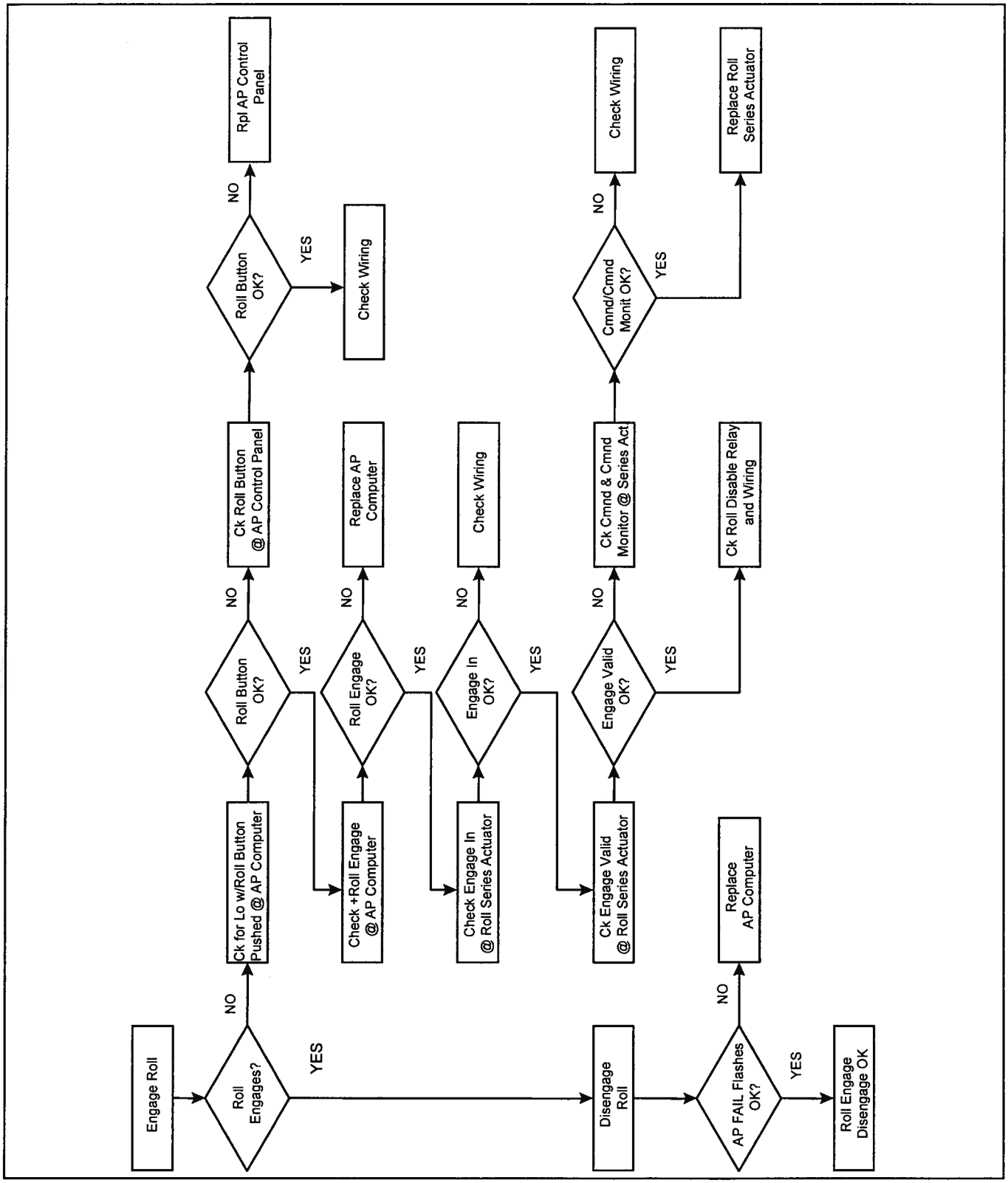

FIGURE C-5 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL ENGAGEMENT/DISENGAGEMENT

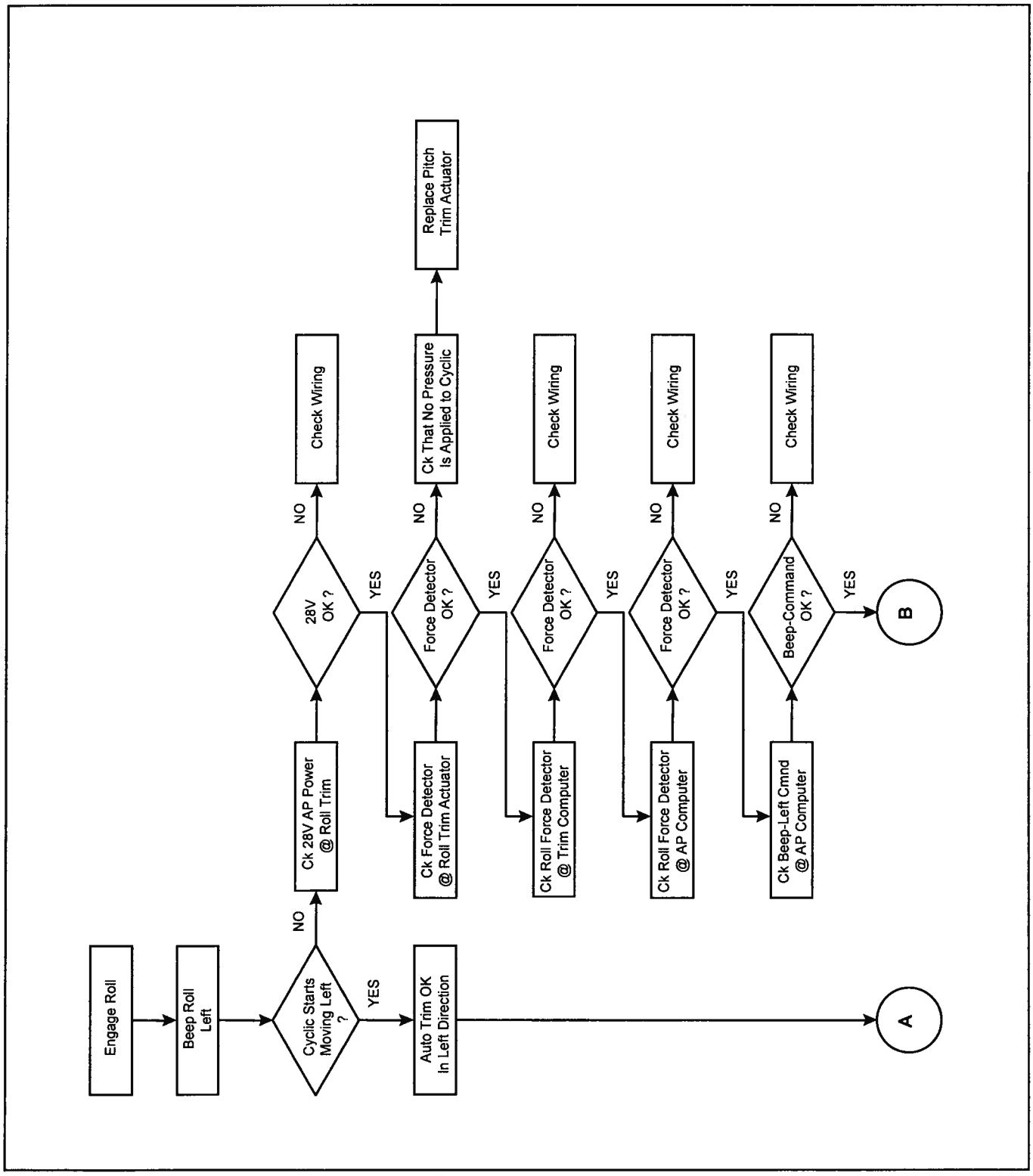

FIGURE C-6 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 1 OF 3)

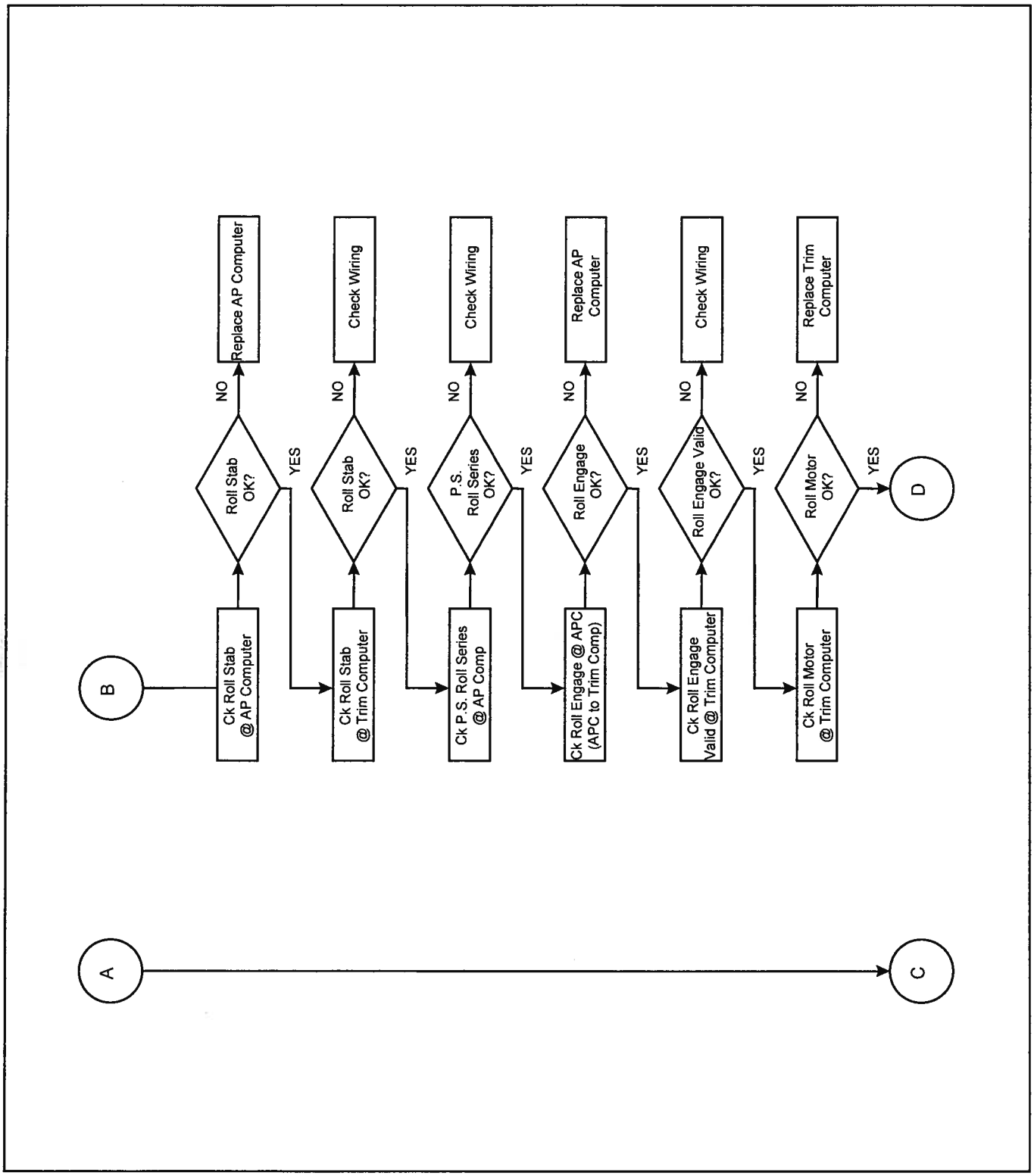

FIGURE C-6 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 2 OF 3)

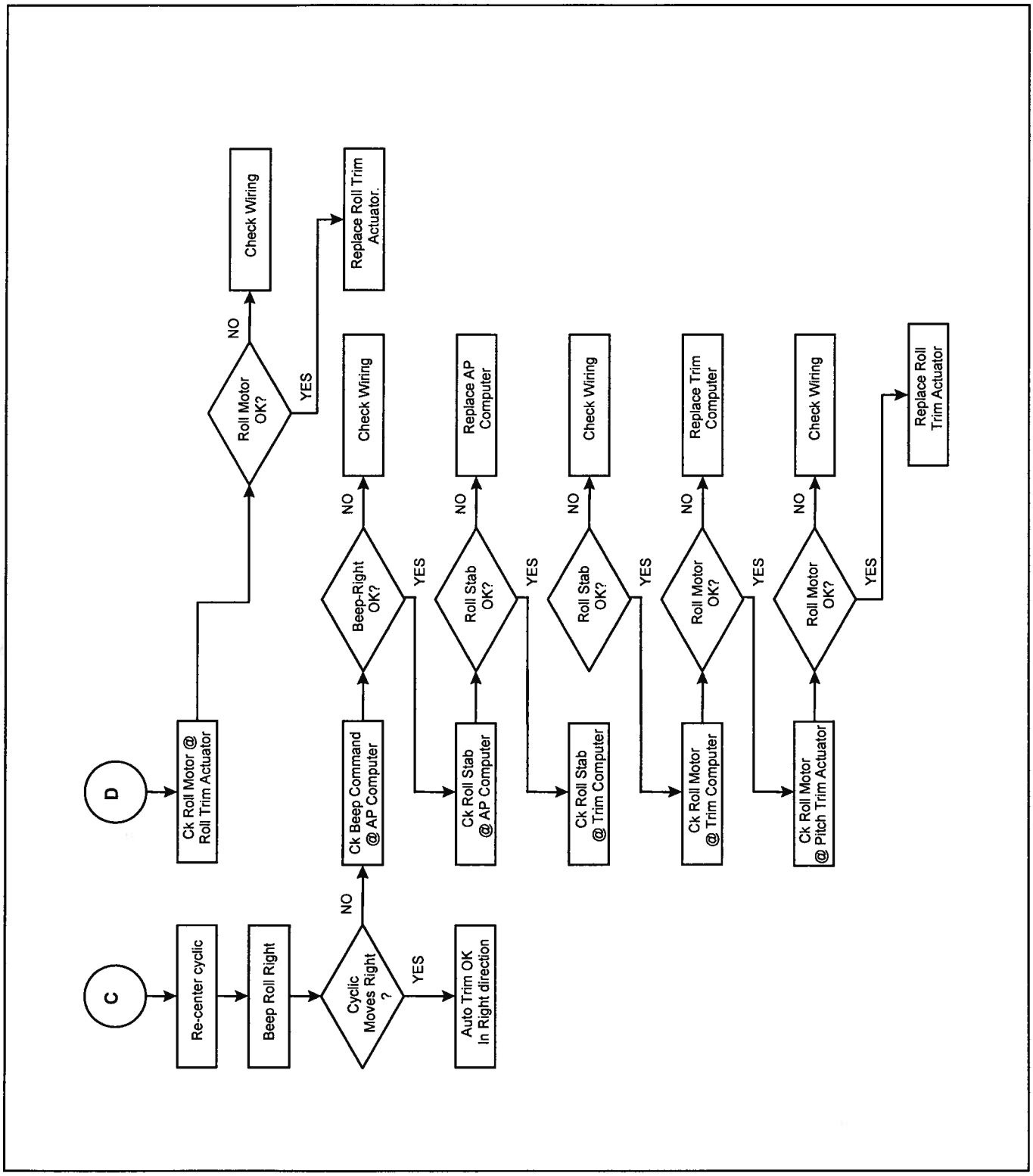

FIGURE C-6 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 3 OF 3)

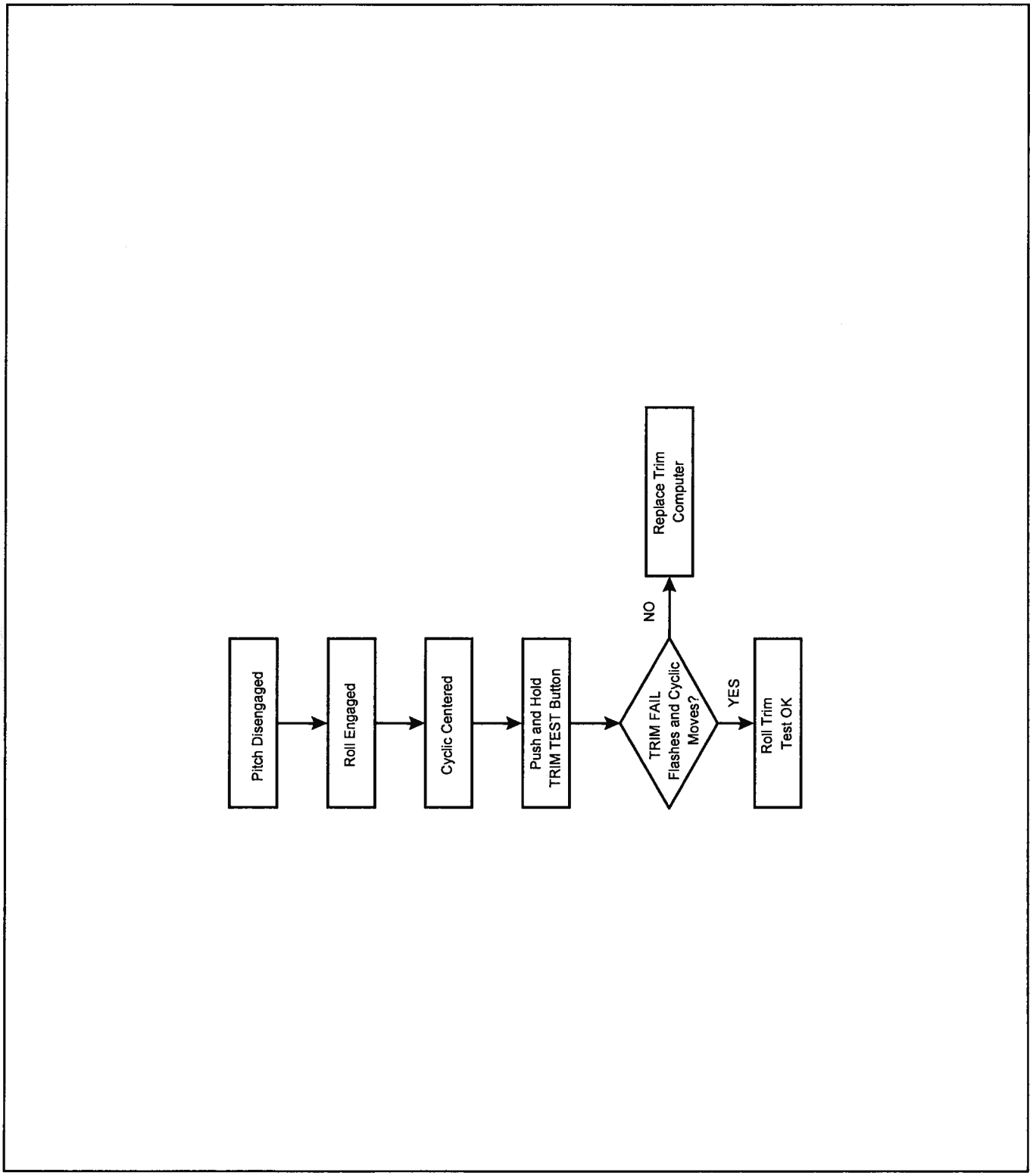

FIGURE C-7 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL TRIM TEST

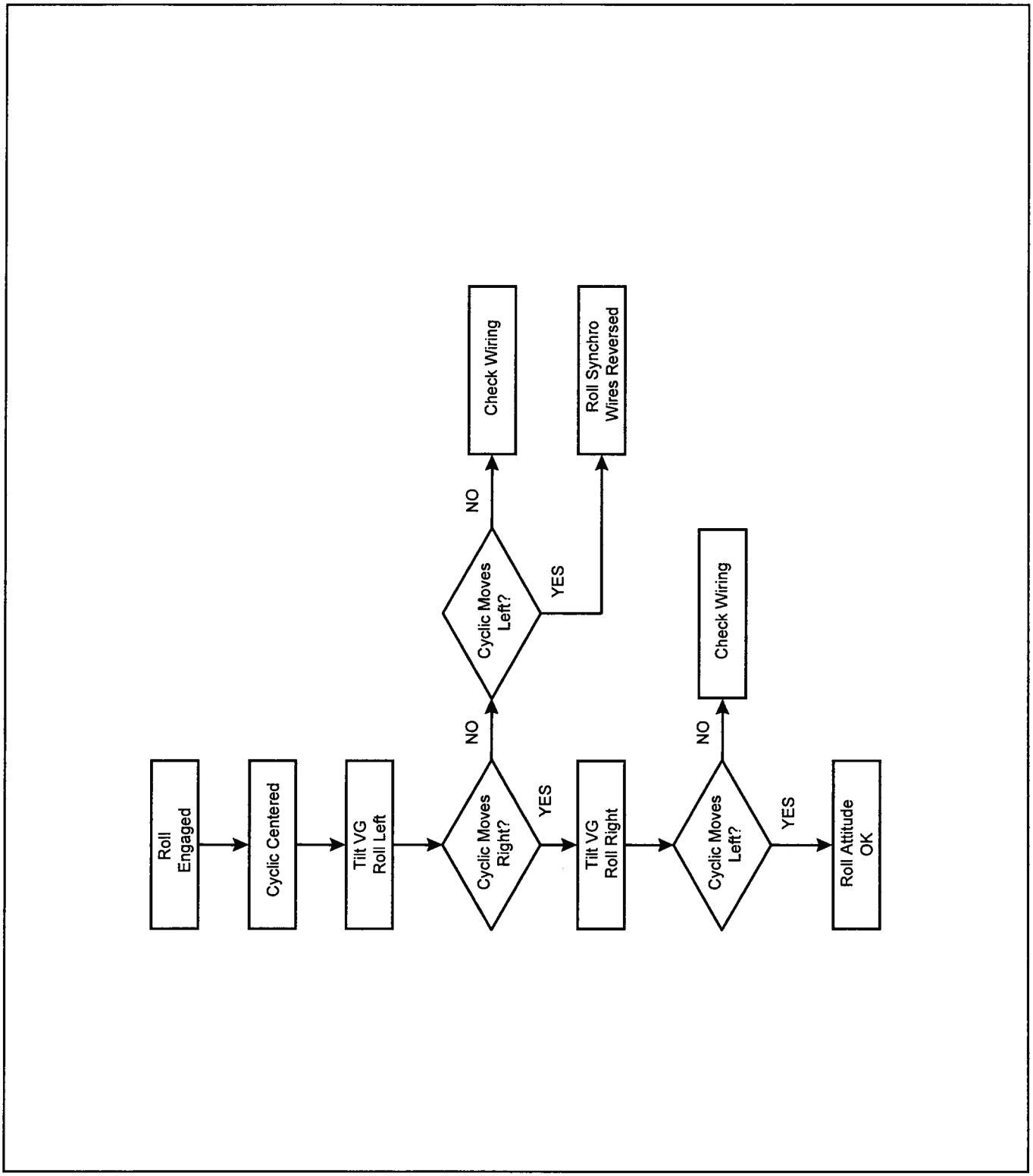

FIGURE C-8 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER ROLL ATTITUDE

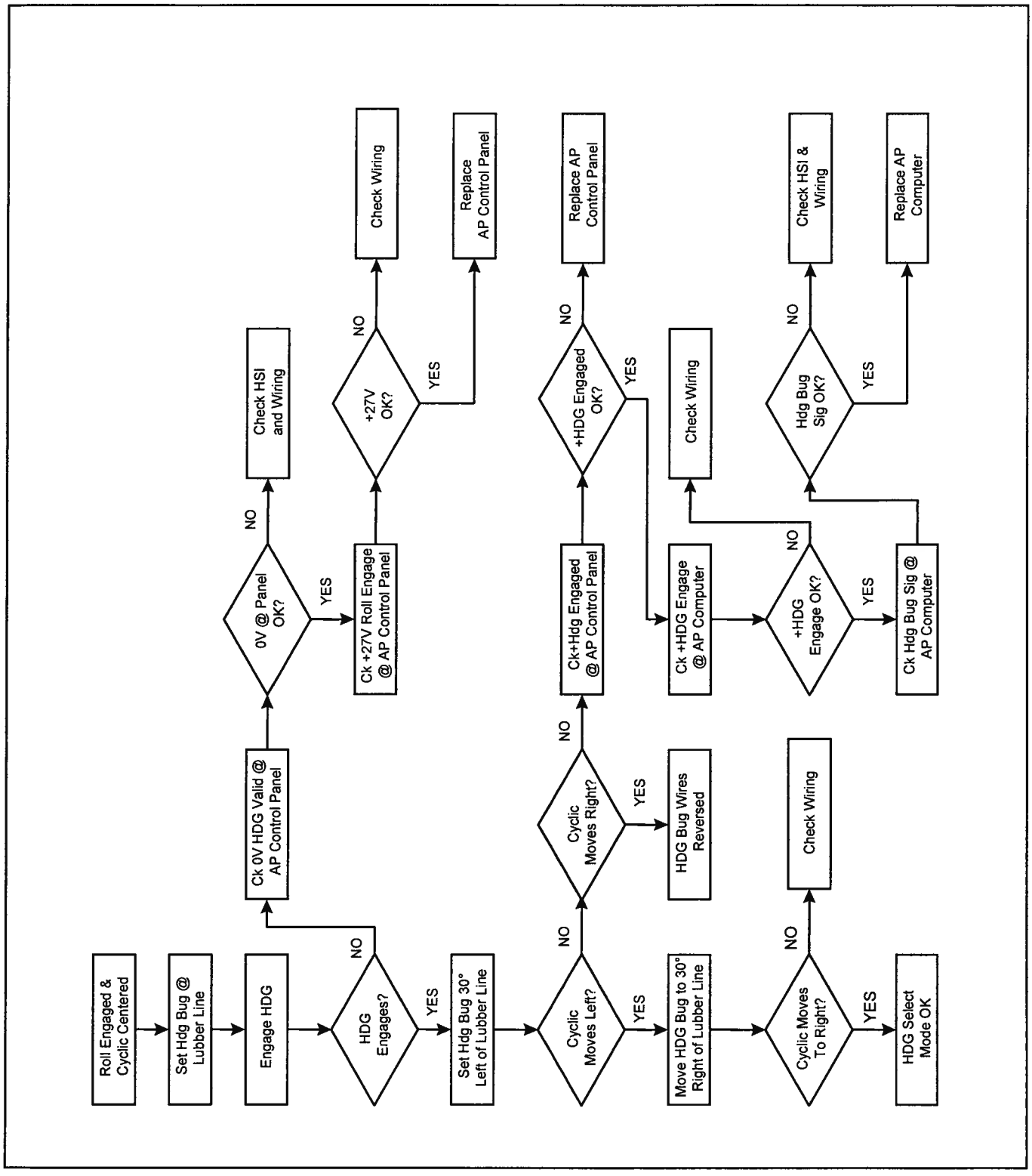

FIGURE C-9 — AUTOPILOT WITHOUT CDV-85 FLIGHT DIRECTOR/COUPLER HEADING SELECT

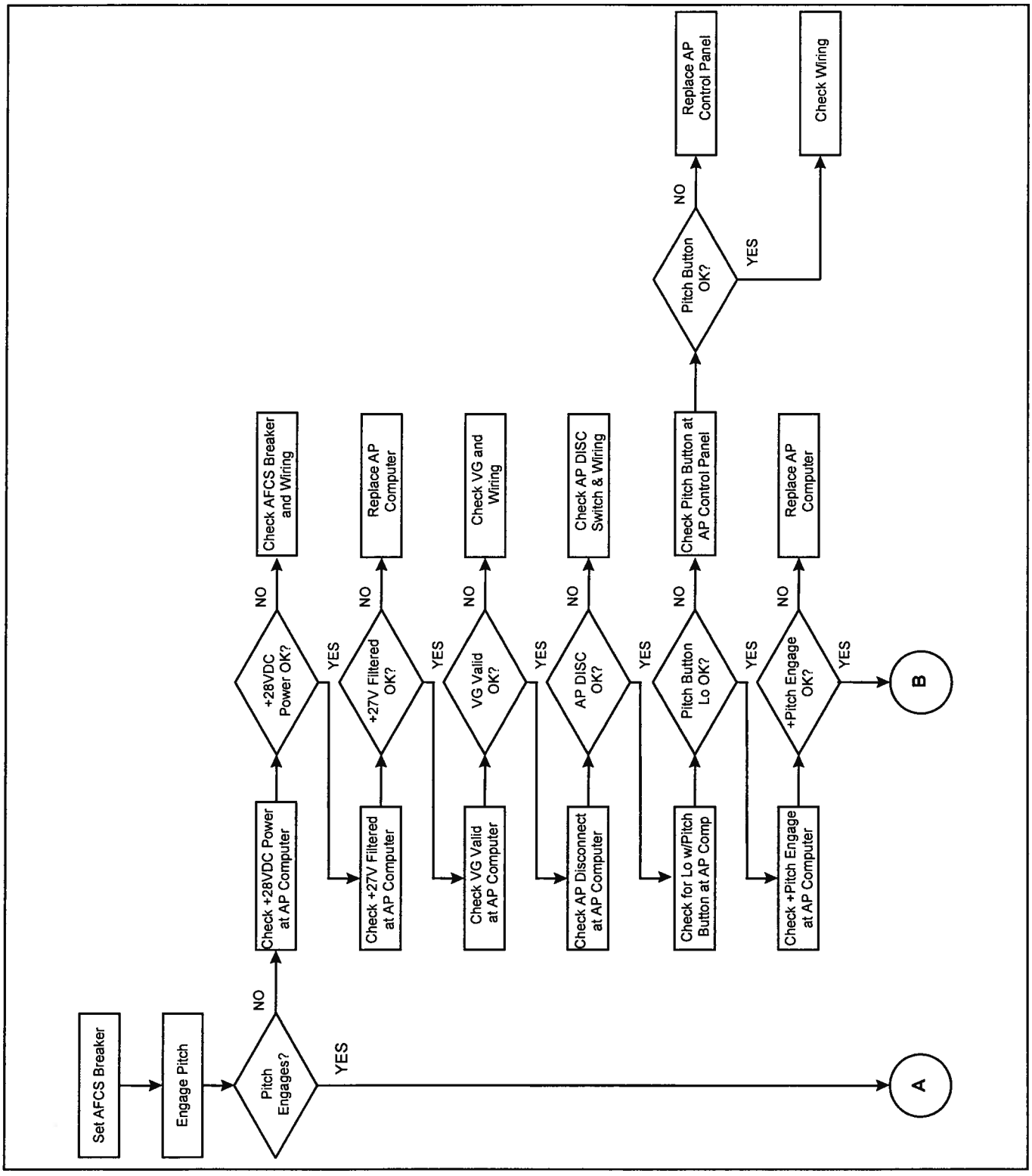

FIGURE C-10 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ENGAGEMENT/DISENGAGEMENT (SHEET 1 OF 2)

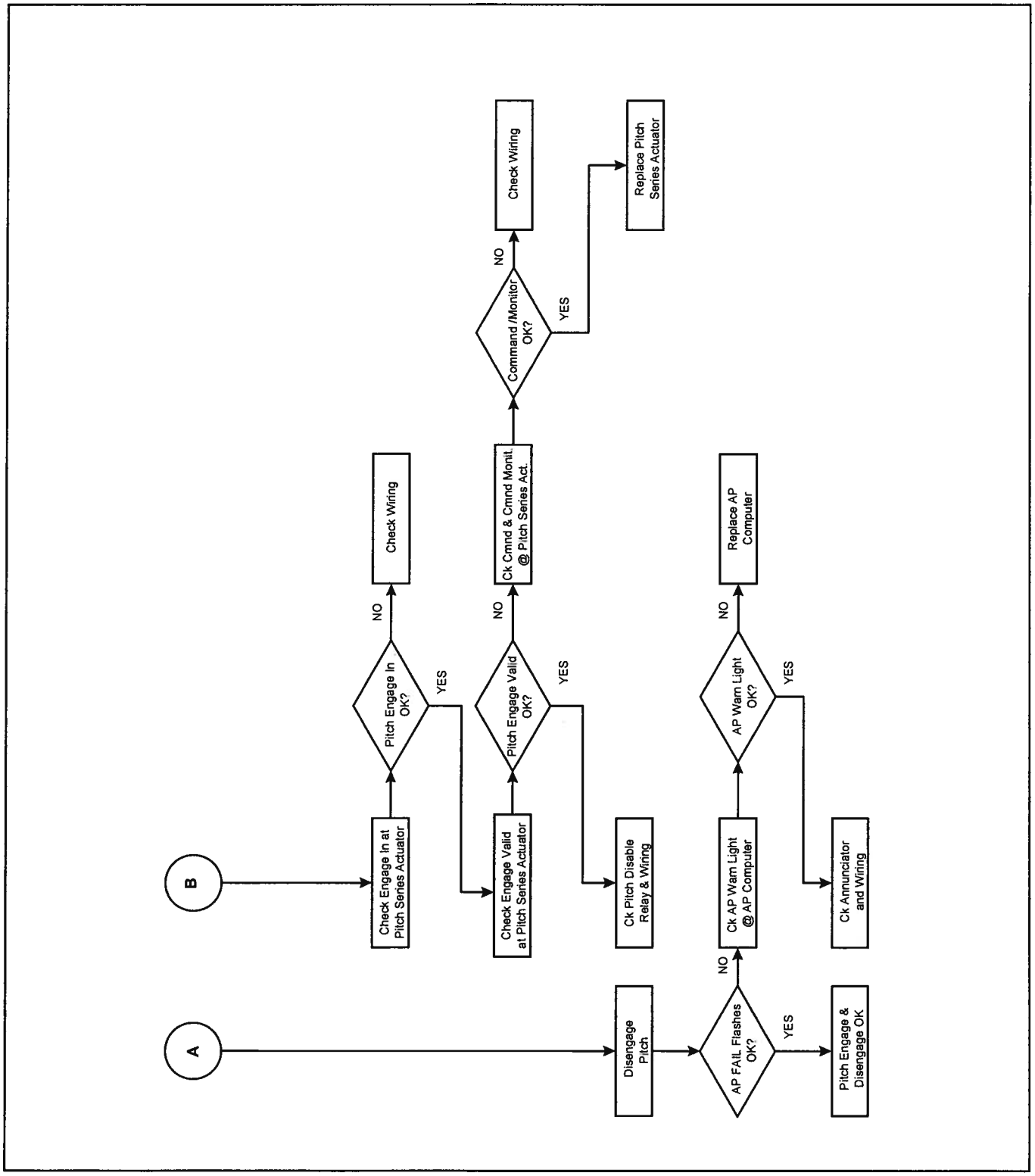

FIGURE C-10 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ENGAGEMENT/DISENGAGEMENT (SHEET 2 OF 2)

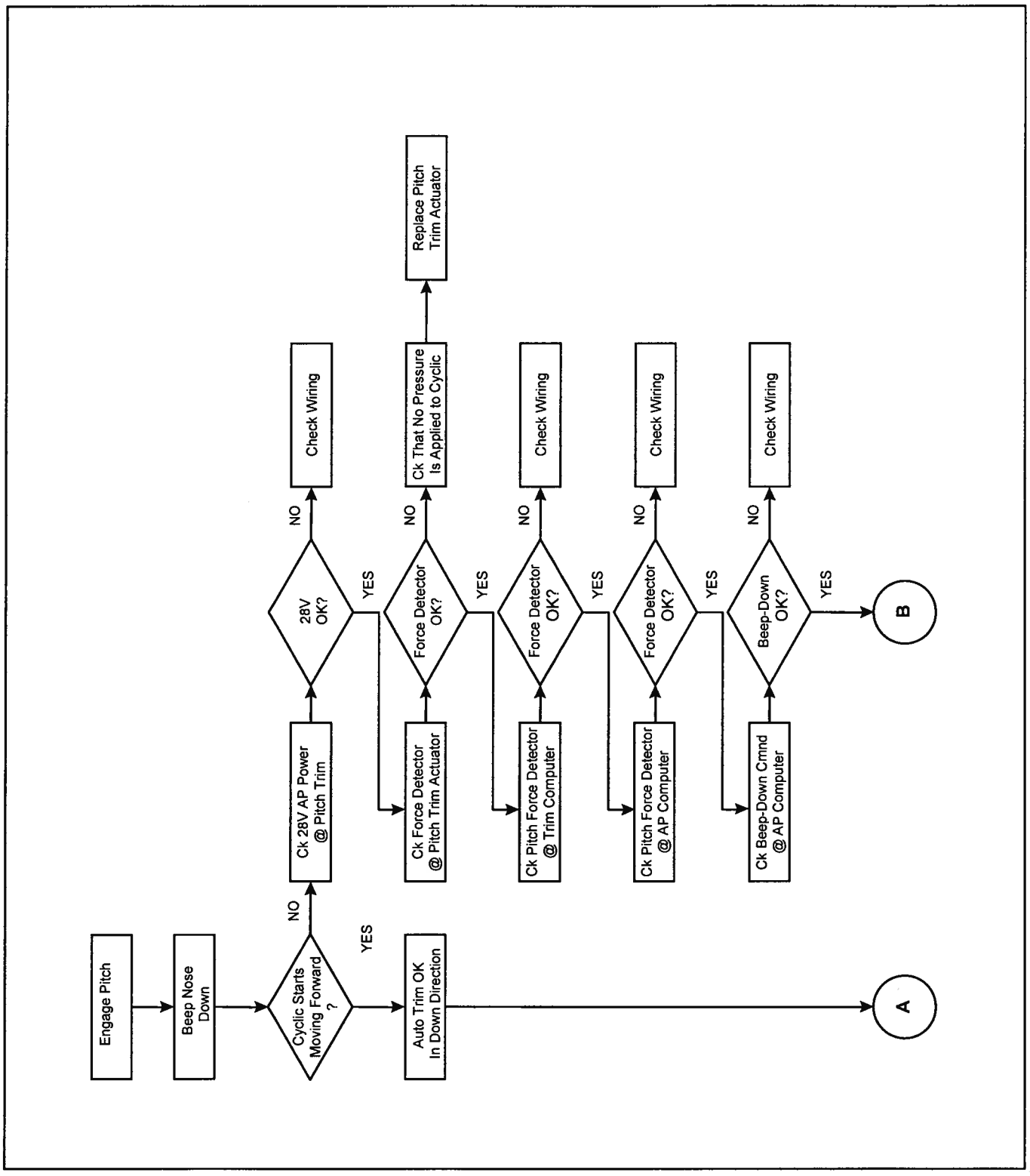

FIGURE C-11 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 1 OF 3)

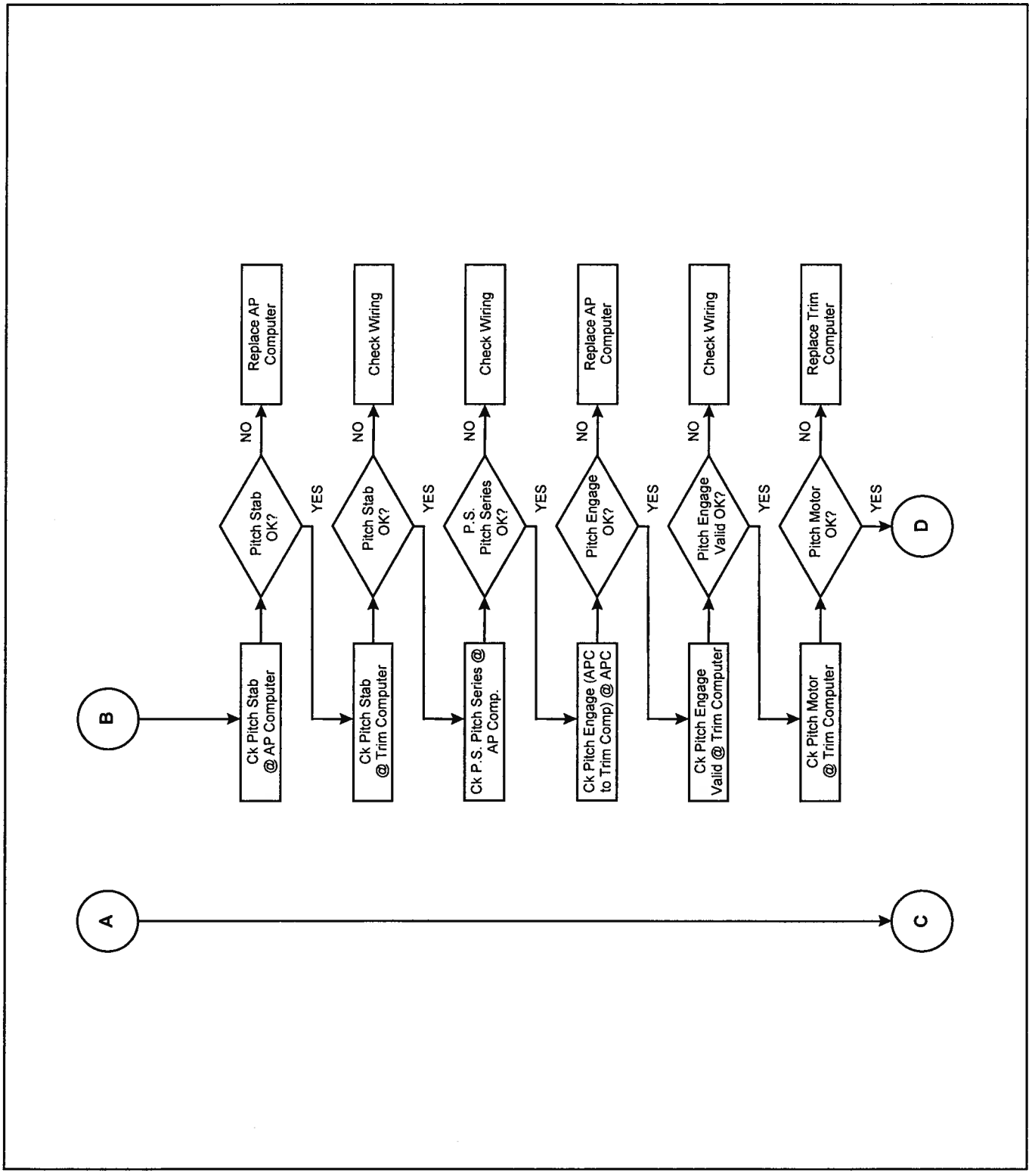

FIGURE C-11 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 2 OF 3)

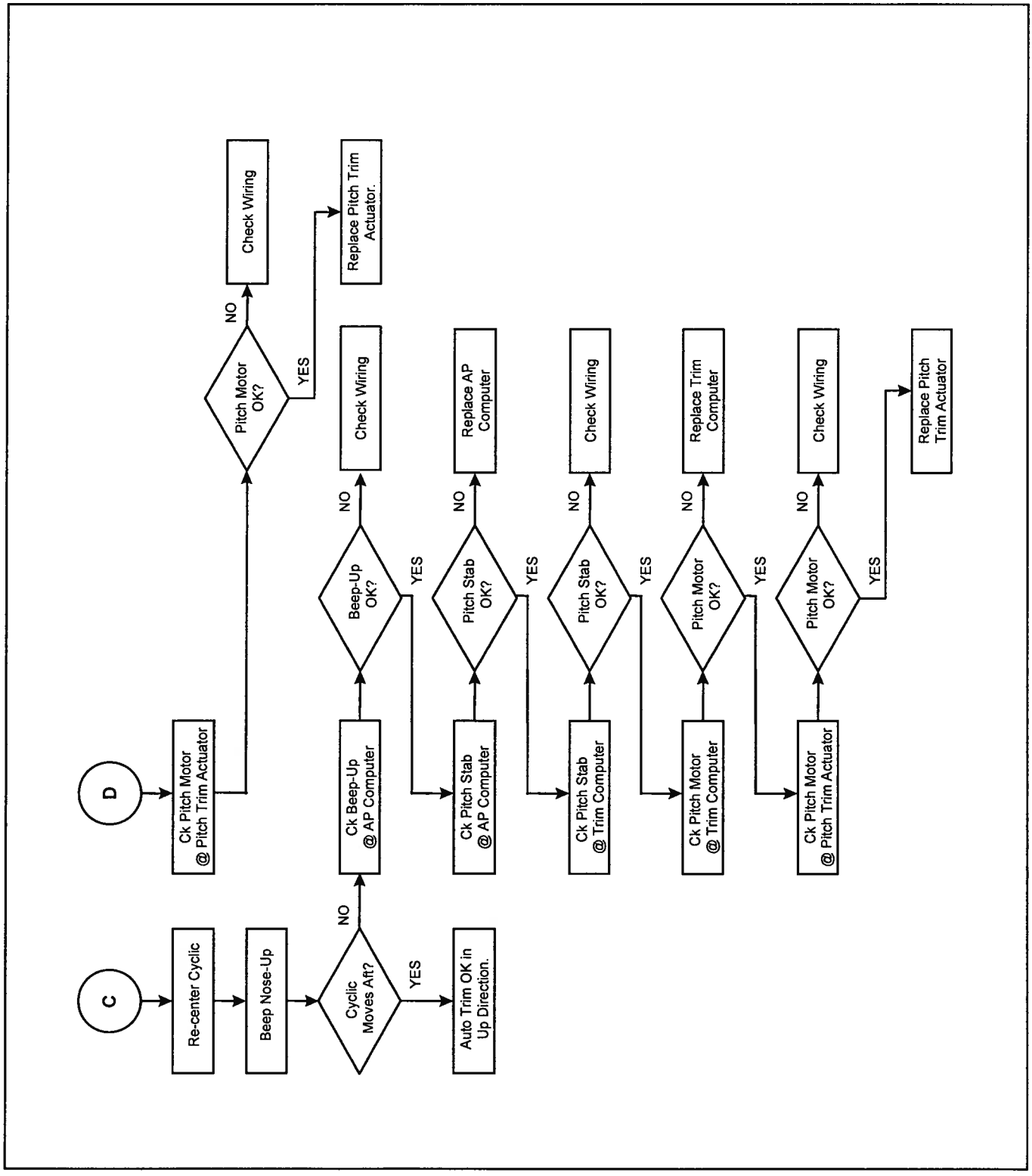

FIGURE C-11 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH AUTO TRIM AND FORCE DETECTOR (SHEET 3 OF 3)

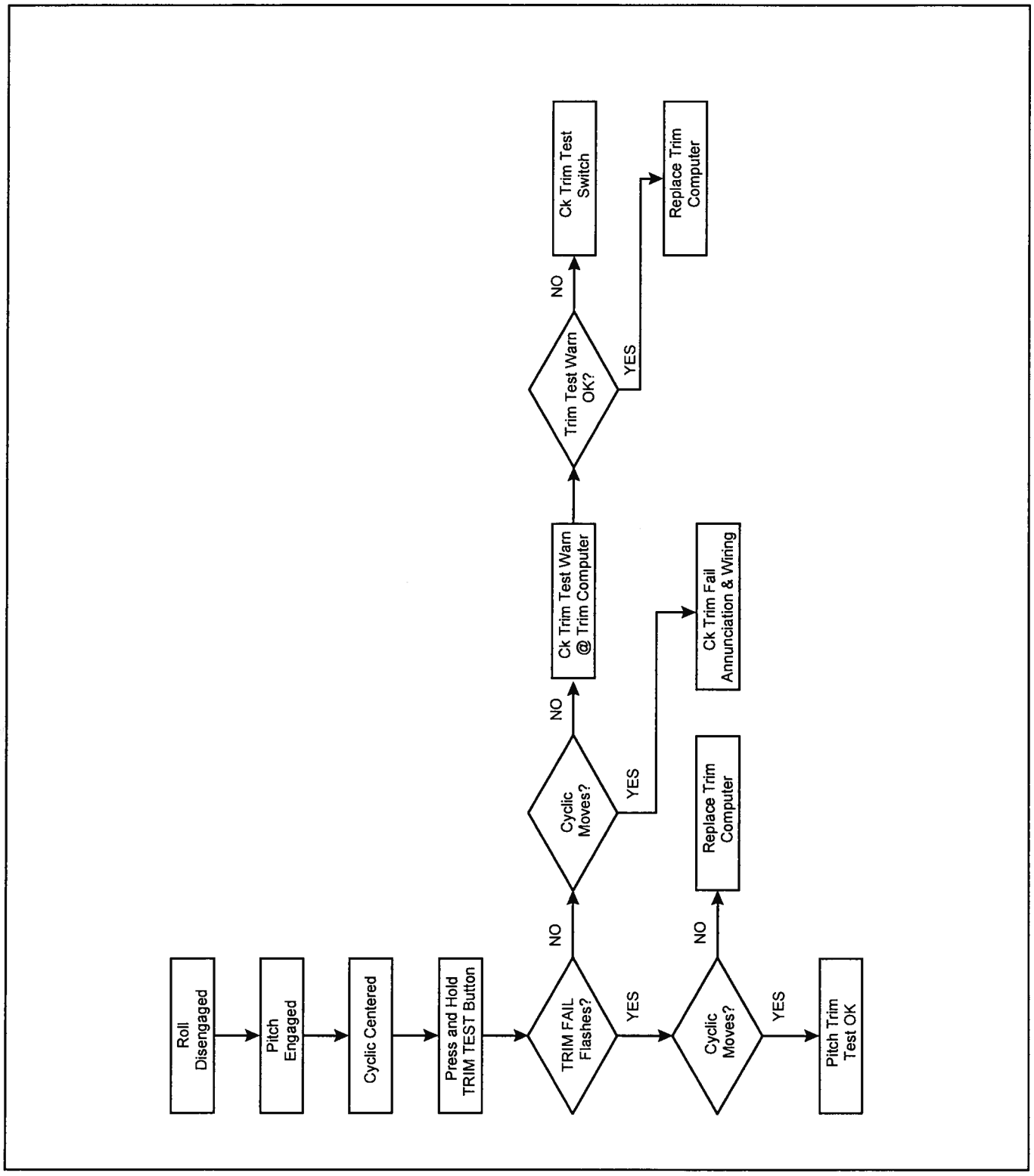

FIGURE C-12 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH TRIM TEST

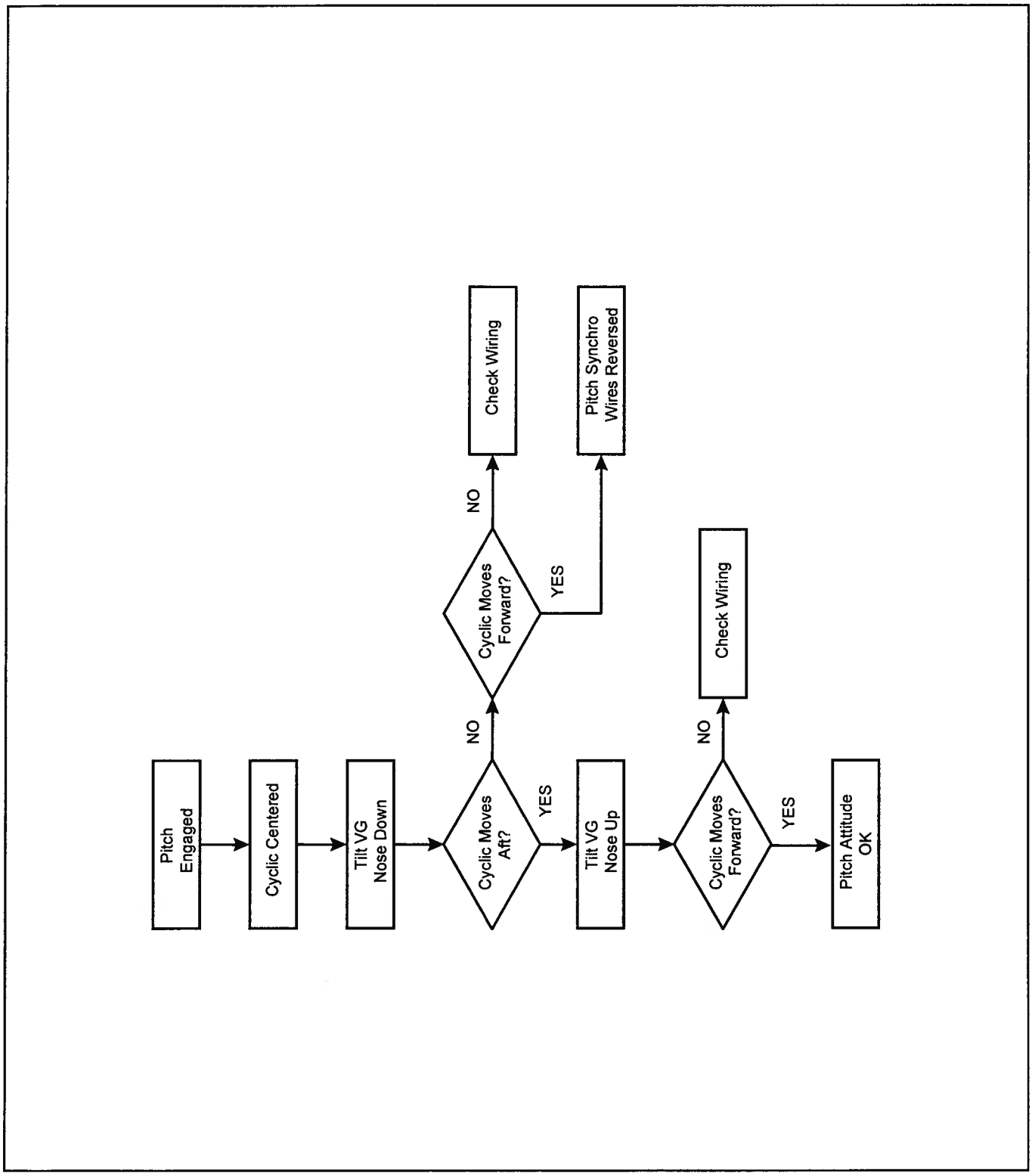

FIGURE C-13 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER PITCH ATTITUDE

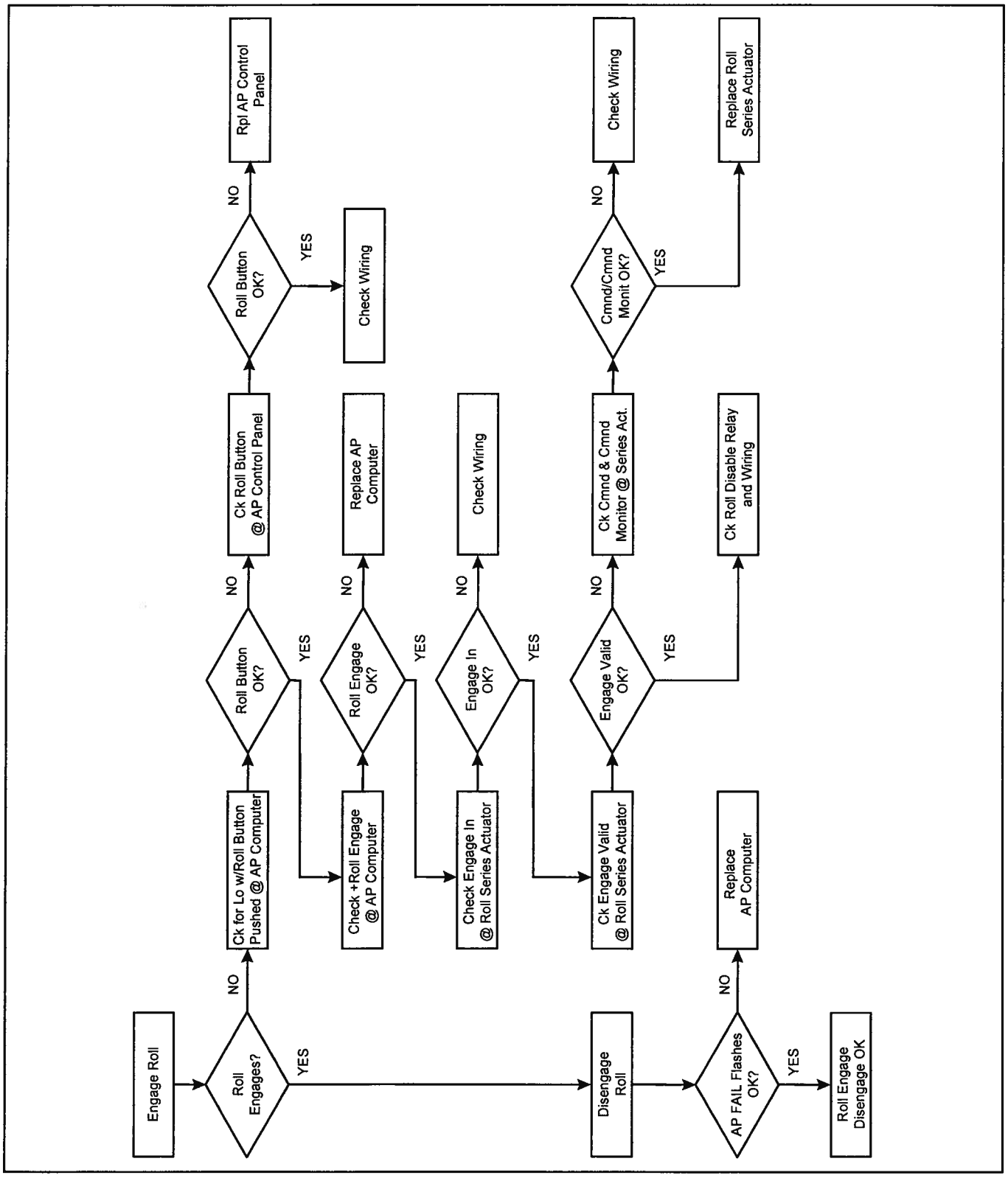

FIGURE C-14 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL ENGAGEMENT/DISENGAGEMENT

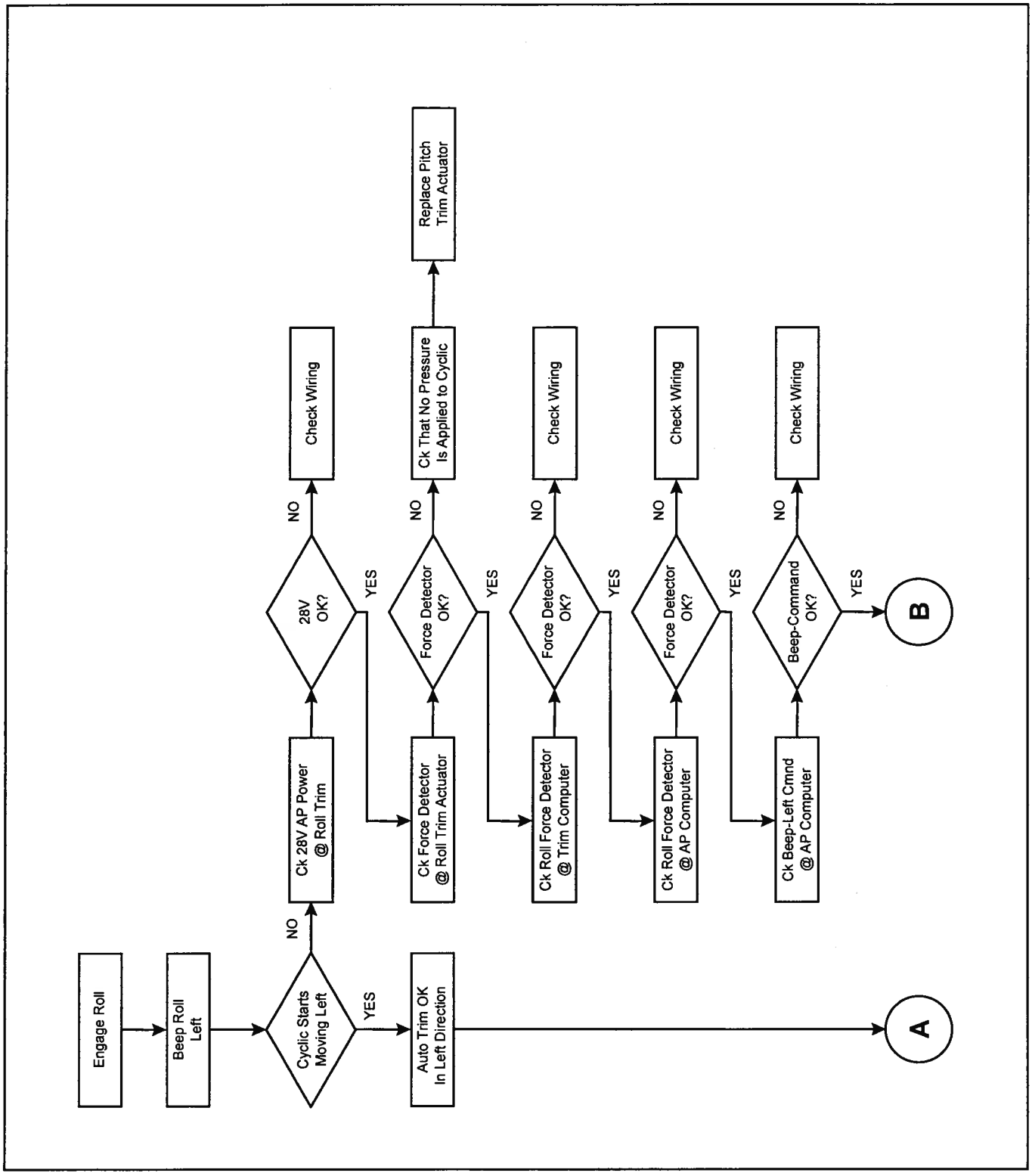

FIGURE C-15 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 1 OF 3)

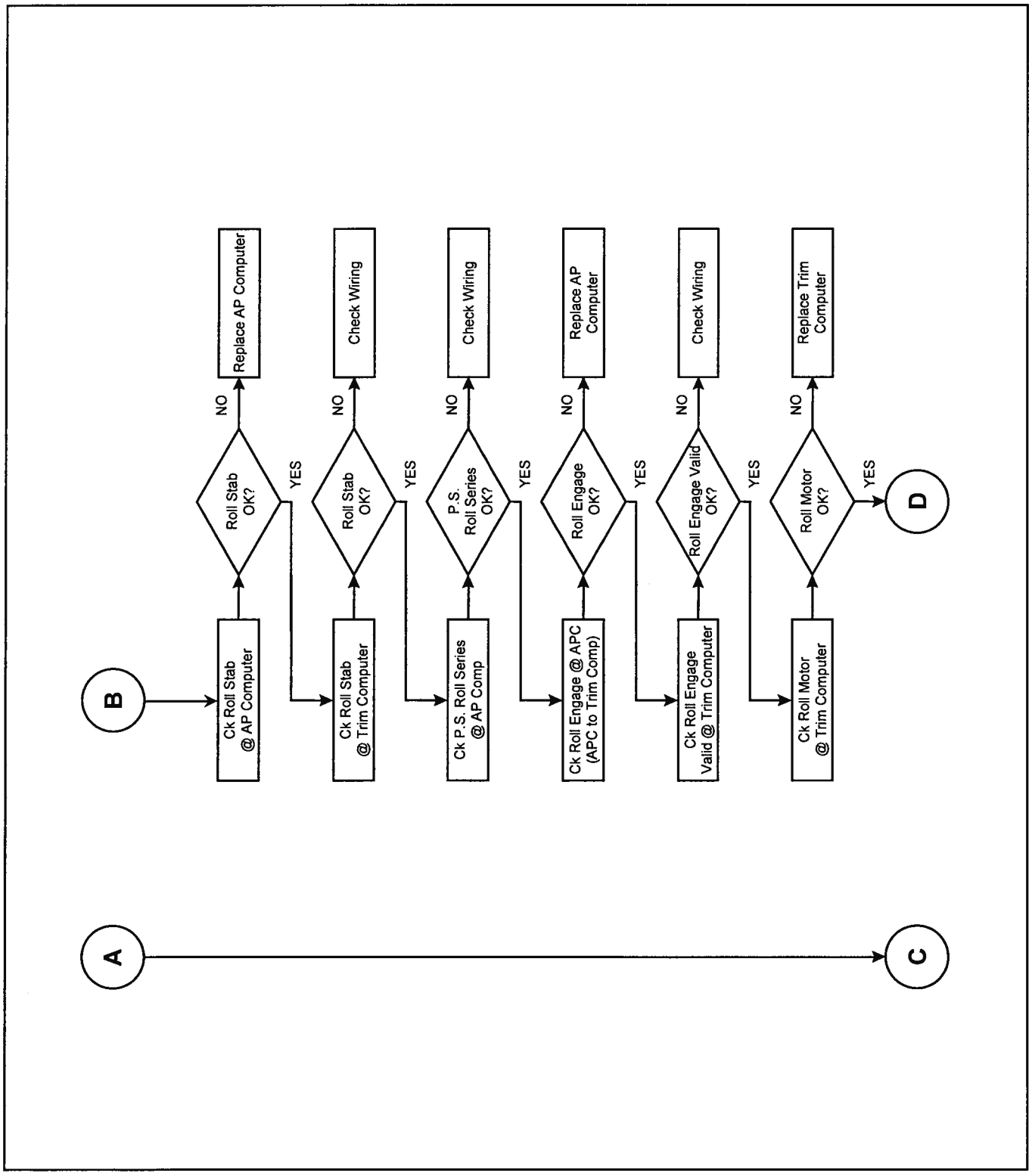

FIGURE C-15 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 2 OF 3)

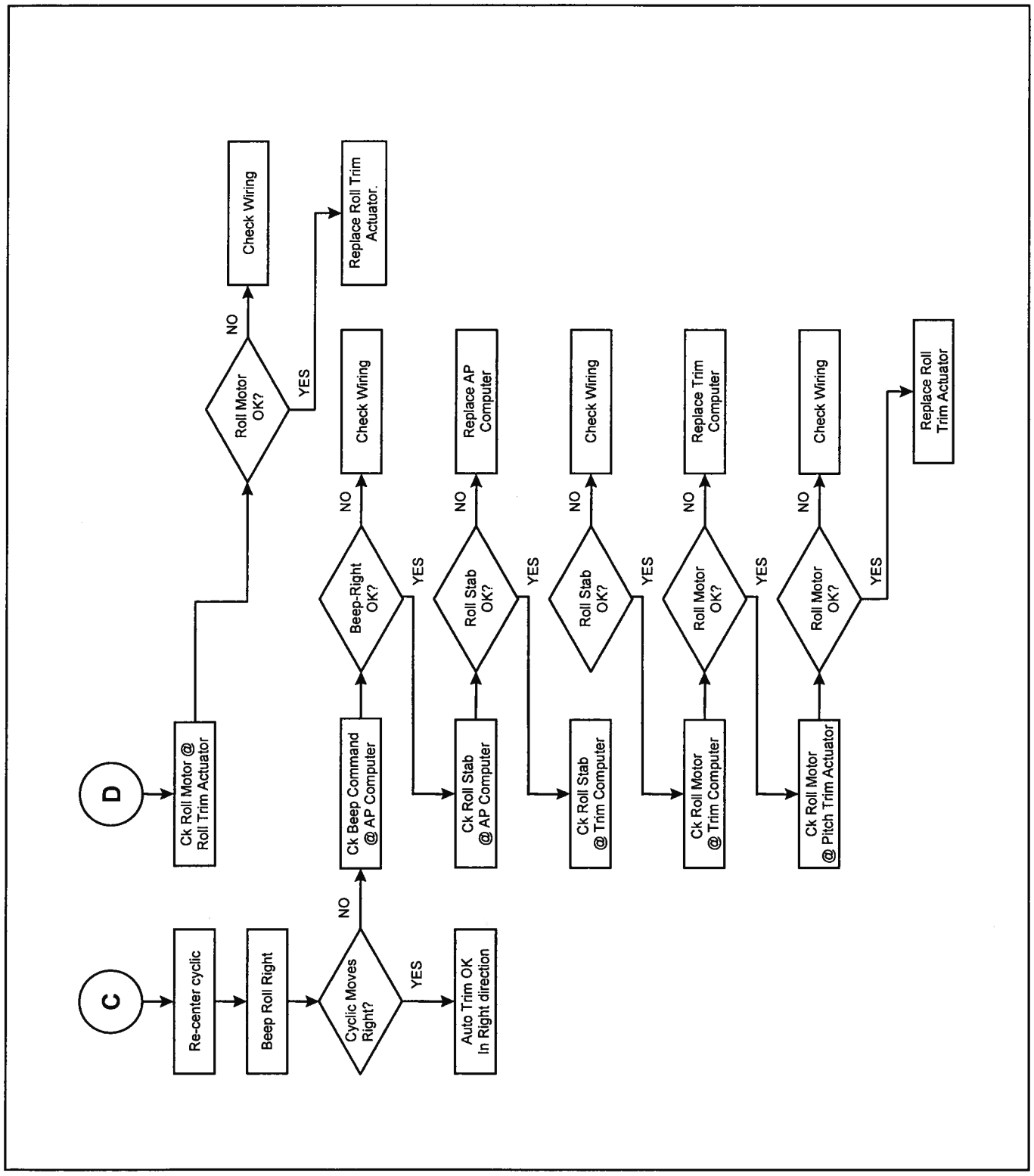

FIGURE C-15 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL AUTO TRIM AND FORCE DETECTOR (SHEET 3 OF 3)

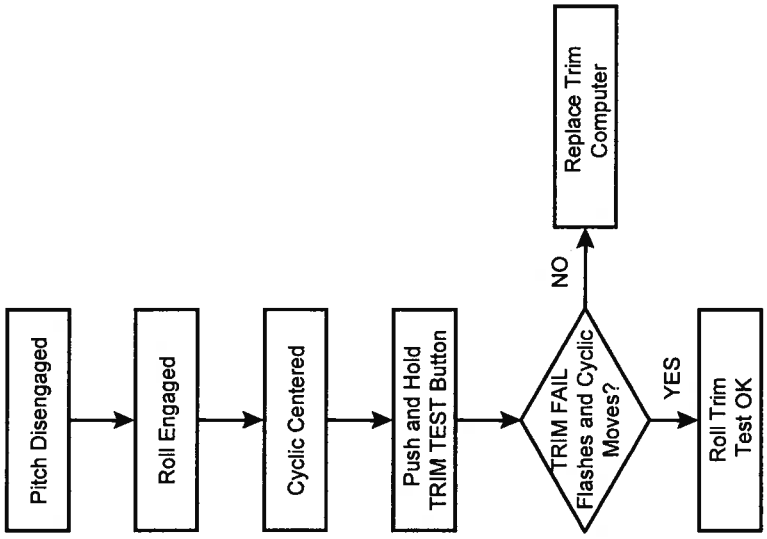

FIGURE C-16 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL TRIM TEST

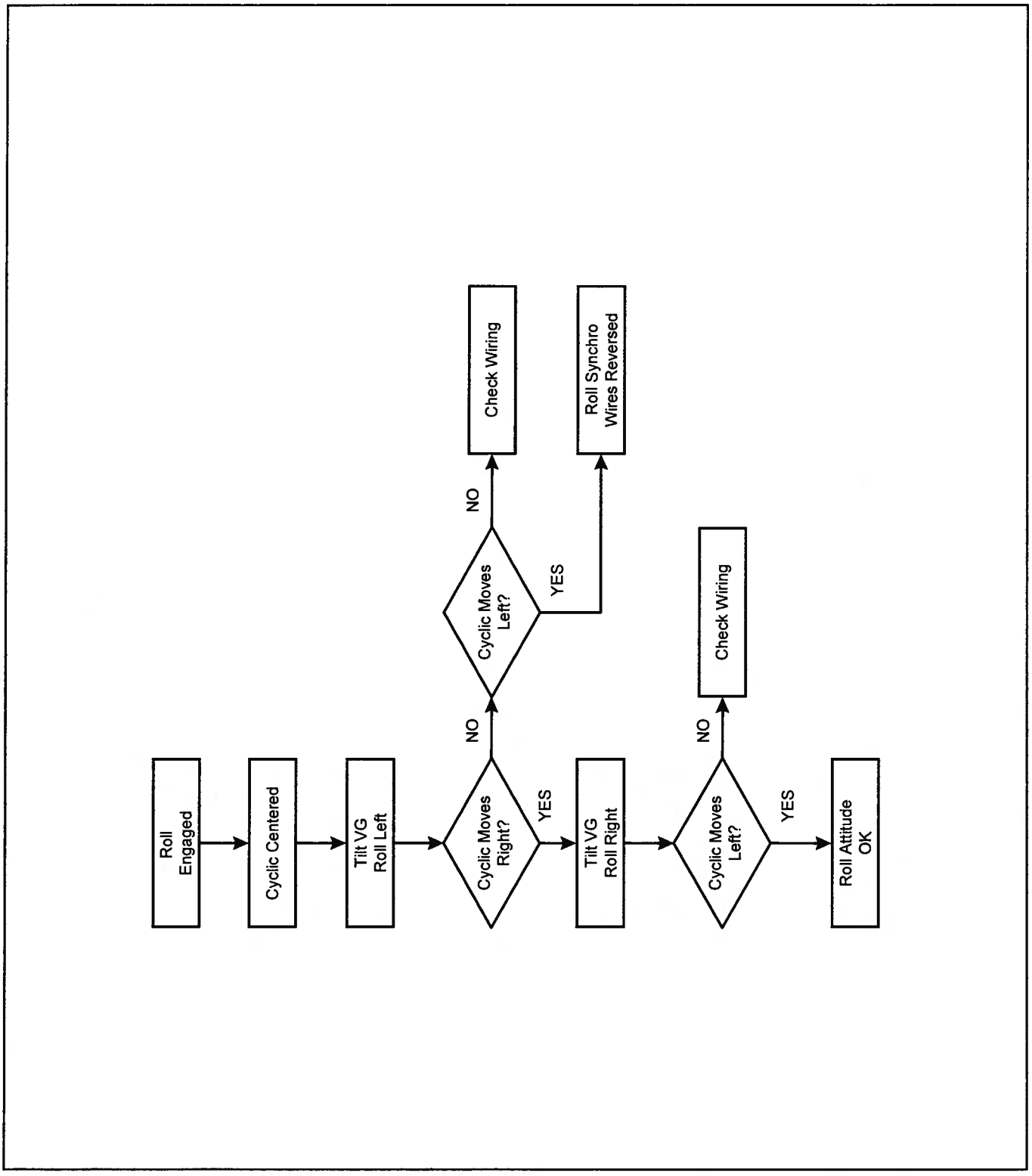

FIGURE C-17 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER ROLL ATTITUDE

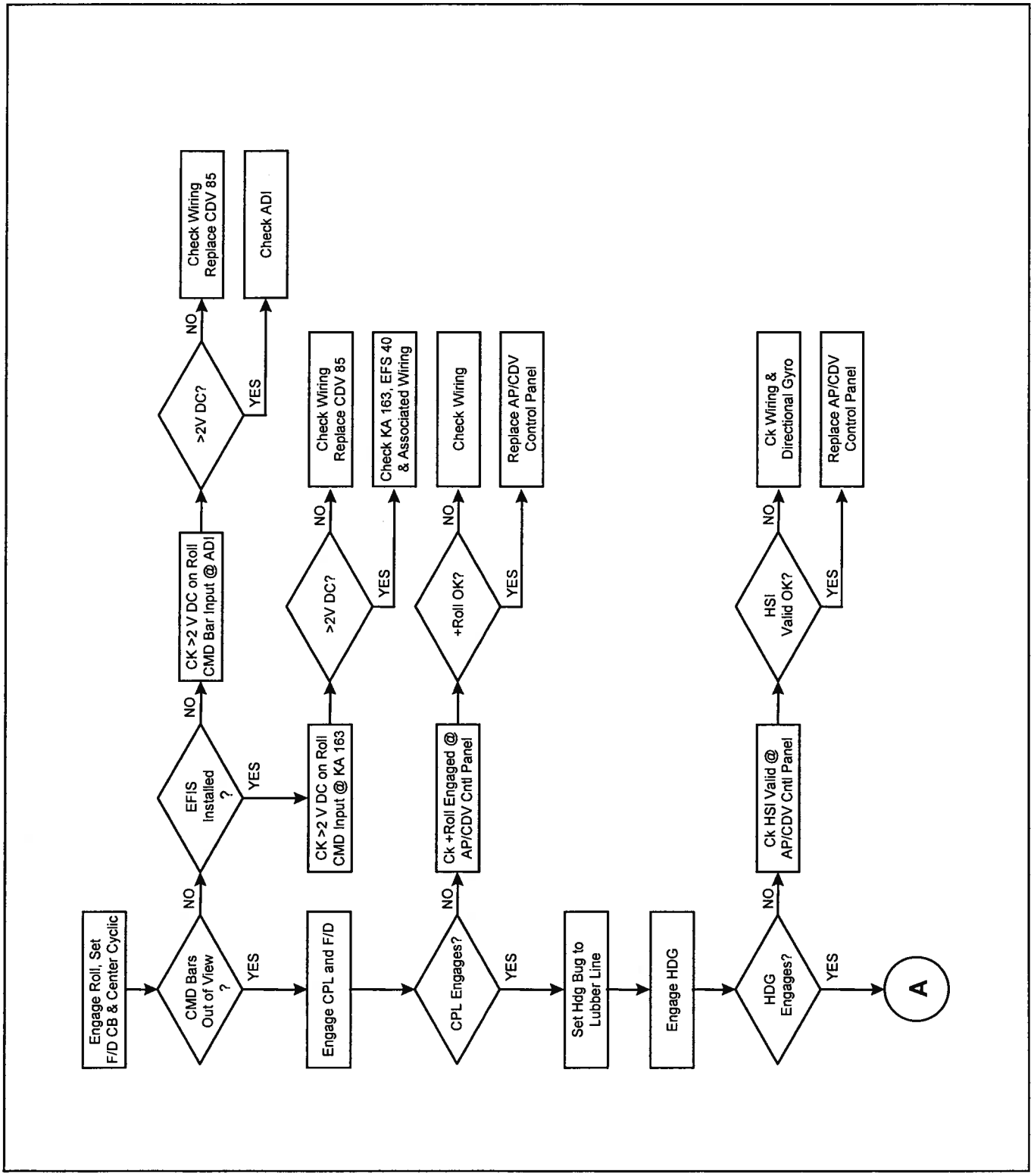

FIGURE C-18 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER HEADING SELECT (SHEET 1 OF 3)

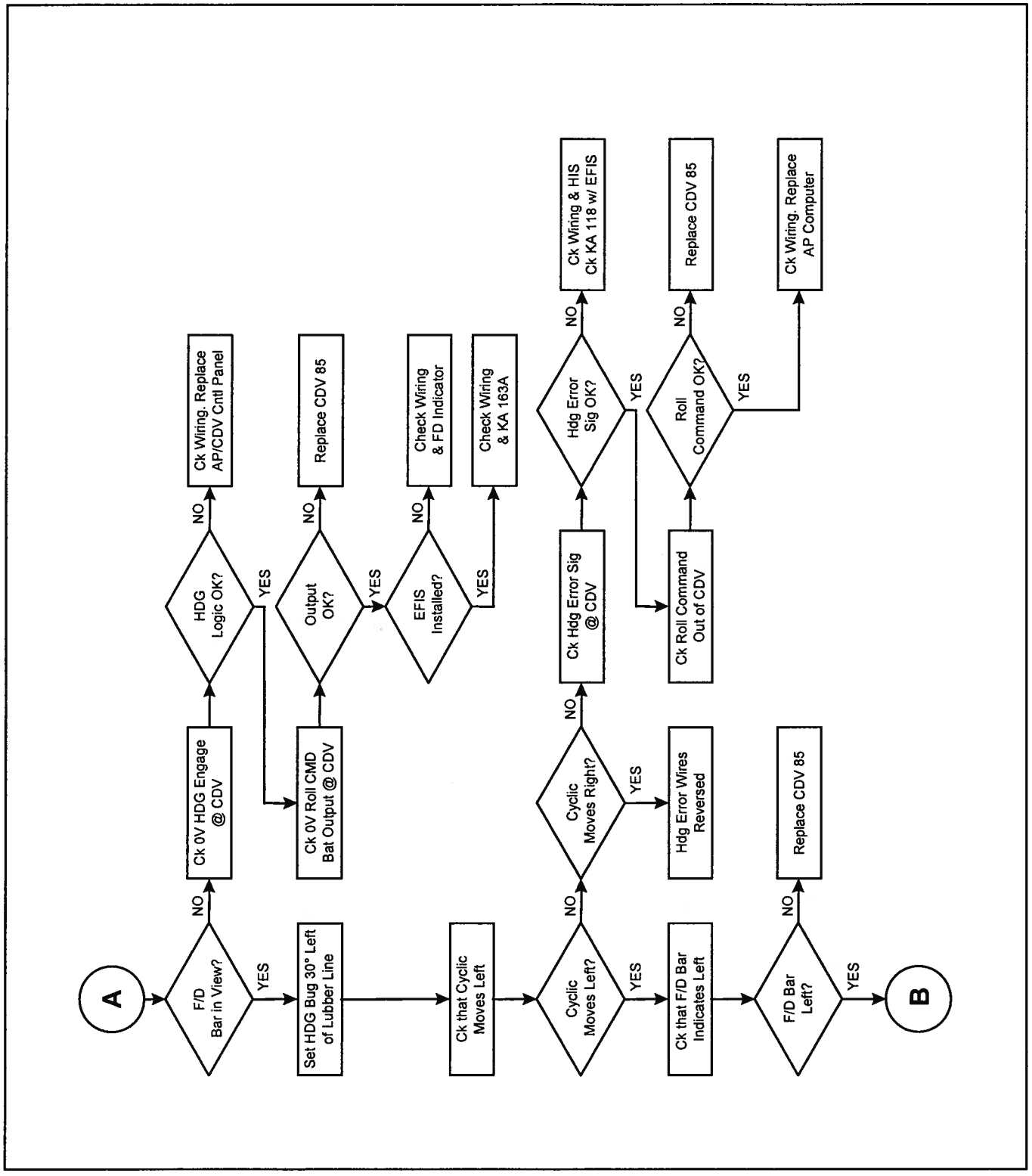

FIGURE C-18 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER HEADING SELECT (SHEET 2 OF 3)

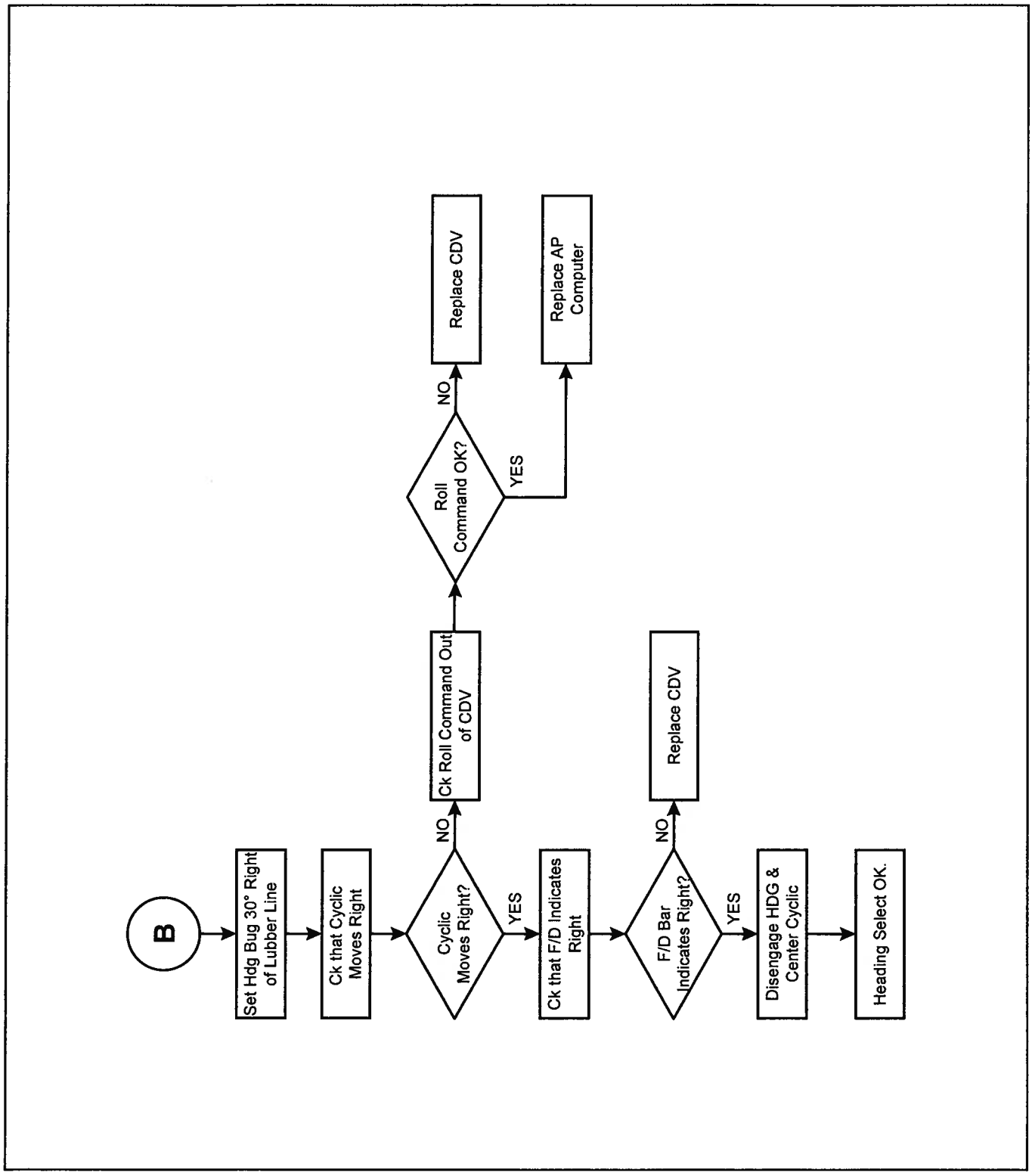

FIGURE C-18 — AUTOPILOT WITH CDV-85 FLIGHT DIRECTOR/COUPLER HEADING SELECT (SHEET 3 OF 3)

APPENDIX D

Yaw SEMA Operational Checks

D1.0 YAW SAS CHECKOUT

NOTE

The Fiber Optic Gyro (FOG) is a rate sensing device. Therefore it will only send a driving command to the yaw SEMA while it is being rotated. To perform this test it will be necessary to have the FOG unsecured from its rack so that it can be rotated about the horizontal plane. It will also be necessary to visually monitor the yaw SEMA and to have the heading reference sensor valid.

D1.1 YAW SAS ENGAGEMENT/DISENGAGEMENT AND AP FAIL ANNUNCIATION CHECKOUT (REFER TO FIGURE D-1)

1. Set the Yaw SAS breaker. Engage the Yaw SAS by pressing the Y button once on the autopilot control panel. Check that the Y button is illuminated. _____
2. Momentarily press the AP disengage button on the cyclic grip. Check that the Y button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____
3. Engage the Yaw SAS by pressing the Y button on the autopilot control panel. Check that the Y button is illuminated. _____
4. Disengage the Yaw SAS by pressing the Y button again. Check that the Y button is no longer illuminated and that the AP FAIL annunciator flashes for approximately 10 seconds. _____

D1.2 YAW SAS FUNCTION CHECKOUT (REFER TO FIGURE D-2)

1. Engage the Yaw SAS by pressing the Y button on the autopilot control panel. _____
2. While monitoring the yaw SEMA, rotate the FOG in a direction that simulates the aircraft nose rotating to the left. Check that the yaw SEMA extends as long as the FOG is being rotated. _____
3. Rotate the FOG in a direction that simulates the aircraft nose rotating to the right. Check that the yaw SEMA retracts as long as the FOG is being rotated. Disengage the yaw SAS. Secure the FOG. _____

D1.3 CONCLUSION

1. Remove electrical power from the helicopter. _____
2. Perform the necessary inspections on all areas opened to perform this test. _____
3. Perform any additional tests and inspections necessary to confirm that the helicopter is in an airworthy condition in preparation for flight. _____

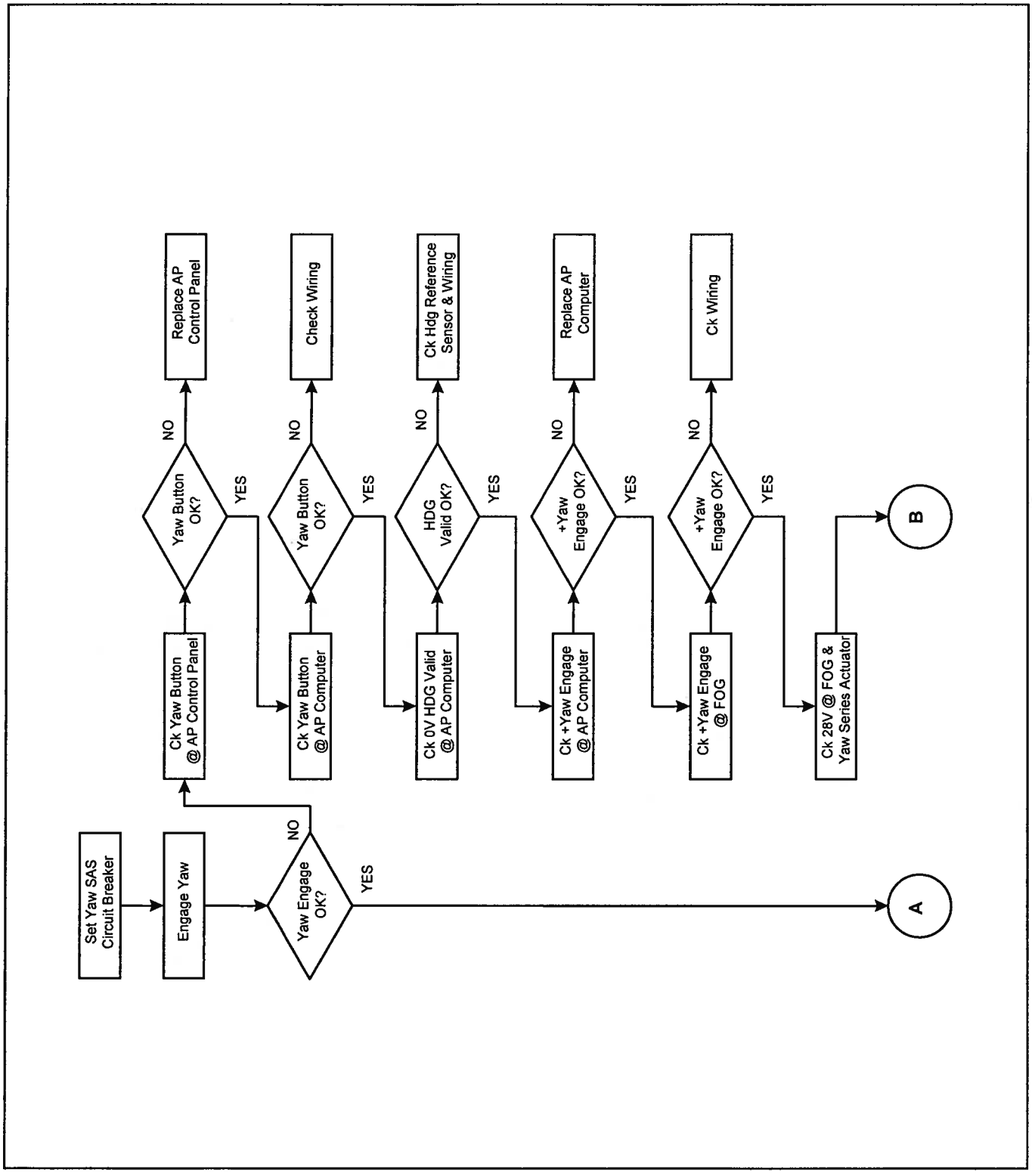

FIGURE D-1 —YAW SAS ENGAGEMENT/DISENGAGEMENT (SHEET 1 OF 2)

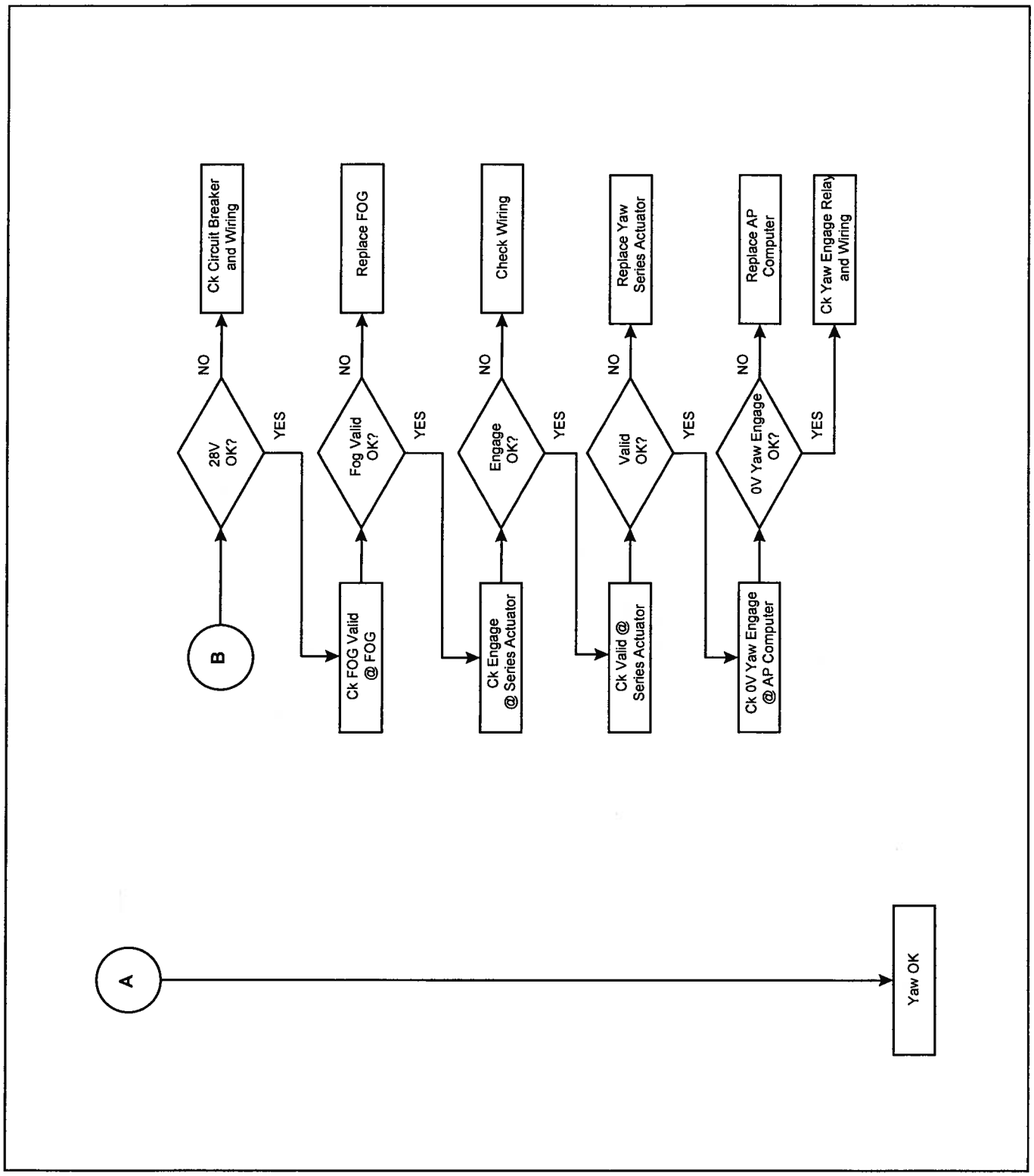

FIGURE D-1 —YAW SAS ENGAGEMENT/DISENGAGEMENT (SHEET 2 OF 2)

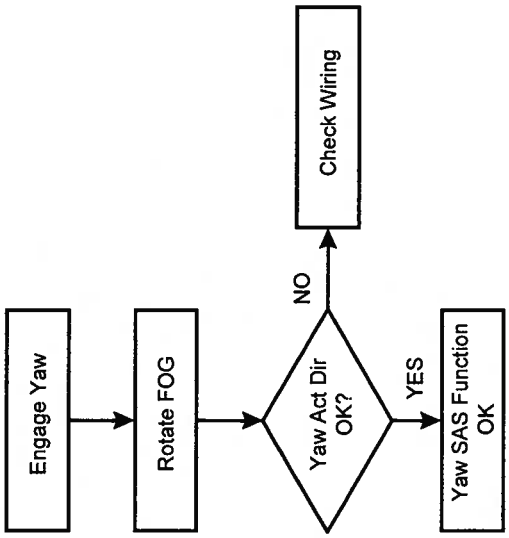

FIGURE D-2 —YAW SAS FUNCTION

APPENDIX E

Fiber Optic Gyro Operational Checks

E1.0 FIBER OPTIC GYRO CHECKOUT (REFER TO FIGURE E-1)

NOTE

The Fiber Optic Gyro (FOG) is a rate sensing device. Therefore it will only send a driving command to the yaw SEMA while it is being rotated. To perform this test it will be necessary to have the FOG unsecured from its rack so that it can be rotated about the horizontal plane. It will also be necessary to visually monitor the yaw SEMA and to have the heading reference sensor valid.

1. Engage the Yaw SAS by pressing the Y button on the autopilot control panel. _____
2. While monitoring the yaw SEMA, rotate the FOG in a direction that simulates the aircraft nose rotating to the left. Check that the yaw SEMA extends as long as the FOG is being rotated. _____
3. Rotate the FOG in a direction that simulates the aircraft nose rotating to the right. Check that the yaw SEMA retracts as long as the FOG is being rotated. Disengage the yaw SAS. Secure the FOG. _____

E2.0 CONCLUSION

1. Remove electrical power from the helicopter. _____
2. Perform the necessary inspections on all areas opened to perform this test. _____
3. Perform any additional tests and inspections necessary to confirm that the helicopter is in an airworthy condition in preparation for flight. _____

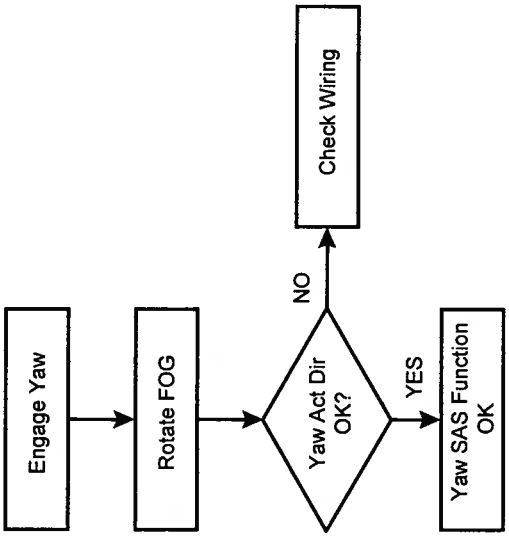

FIGURE E-2 —FIBER OPTIC GYRO FUNCTION